

The Iron Age

A Review of the Hardware and Metal Trades.

Published every Thursday Morning by DAVID WILLIAMS, No. 10 Warren Street, New York.

Vol. XI: No. 20.

New York, Thursday, May 15, 1873.

Four Dollars a Year.
Single Copies, Ten Cents.

The Woolwich 35-Ton Steam Hammer.

We present herewith an illustration of the great 35-ton steam hammer, now building at the Royal Gun Manufactory, Woolwich, of which we have previously spoken in these columns. It will be the most powerful steam hammer in Great Britain, if not in the world. It was made by Messrs. Wilson, of Patricroft, and is double-acting—the steam being used to force the hammer down as well as to raise it.

The diameter of the cylinder is 54 in., with a stroke of 10 ft. 6 in. The height from the ground line to the top of the cylinder is about 45 ft. Between the standards or legs of the hammer is about 19 ft., with a clear height of 11 ft. for forging purposes.

From the great length and weight of the cylinder, if it were held only by the bottom flange, the vibration caused by the violent concussions, when the hammer is at work, would probably—as it has done in smaller hammers—crack the cylinder close to the lower flange; there is, therefore, a second flange at some distance from the bottom of the cylinder, and the long bolts from the entablature to the second flange give a certain amount of elasticity to absorb the vibration. The valve is one of Wilson's patent balanced valves, which is easily worked by one man, and can be so regulated as to give the steam on the top of piston or not, at the will of the attendant. There is a well in the hammer block for adjusting the distance of the block from the piston in the cylinder. By this means the full amount of stroke can always be obtained, whatever may be the height of the work.

The weight of the falling mass is 35 tons, the amount of fall at full stroke 10 ft. 6 in. By admitting the steam on the top of the piston the velocity of the falling mass can be accelerated to more than double that due to gravity only, and as the power of a blow increases as the square of the velocity, this would be equivalent to a single-acting hammer having a stroke four times the length, or 42 ft., or the same stroke with four times the weight, or 140 tons, or 1470 foot-tons, or to about a 150 ton hammer with a 10 ft. stroke.

The standards are of the ordinary H section, and are bolted to cast iron box girders bedded in concrete. These girders and standards are quite independent of the foundation.

The ground upon which this hammer is being erected having been marsh land, a large amount of expenditure has been necessary to make a foundation which shall be sufficiently solid and elastic enough to withstand the impact from so great a mass. For this purpose the ground was excavated to a depth of nearly 20 ft. for a space of 42 ft. square. In the center of this opening 100 piles were driven in rows of 10, forming a square of 30 ft. on the side. These piles, having been driven as far as they would go, were then cut off level, leaving about 4½ ft. of each pile projecting above the bottom of the hole. Concrete was then filled in up to the level of the heads of the piles. Upon the piles and concrete a cast iron plate 30 ft. square and 11 in. thick, weighing 164 tons, is laid. This plate was cast in three pieces, as so large an area as 30 ft. square with 11 in. thick would probably have caused the plate to be broken in transit. On this plate are two layers of oak timbers 12 in. square placed at right angles to each other, upon which is a plate 27 ft. square, 10 in. thick, weighing 121 tons, and cast in two pieces. Upon this are oak baulks 2 ft. long, placed on end and fitted accurately together to form a mass 24 ft. square, and which are held together primarily by bands of iron 6 in., by 2 in., but which will also be prevented from spreading by the mass of concrete round the outside. On these timbers is another plate 24 ft. square, 12 in. thick, weighing about 120 tons, and cast in halves. Upon this is a thin layer of timber and felt to fill up any inequalities or to make up for any want of flatness in the castings, and then comes another plate 22 ft. square, 12 in. thick, 100 tons weight, and cast in one piece. Upon this is placed the anvil block proper, which is a frustrum of a cone 15 ft. diameter at base, and 12 ft. diameter at top, and nearly 3¼ ft. deep, the weight being about 103 tons, and upon this will be placed another block not yet cast, which will weigh about 70 tons.

It will thus be seen that there will be nearly 700 tons of cast iron forming the foundation of this hammer, and from the experience that has been obtained in forming foundations in this ground it is anticipated that this foundation will be permanent, two other hammers having a similar arrangement not showing the least signs of moving, whereas other foundations in the same department with a greater weight of metal have sunk considerably since they were put down.

The Phoenix Iron Company, Pa., has recently put up two powerful engines, one for pumping water, and the other for hoisting ore, at the Warwick mines at St. Mary's, Chester county. The shaft of the Phoenix Company at St. Mary's is now about 130 feet deep.

Warming Railway Cars.

BY JAMES A. WHITNEY, M. E.

During the six months previous to May, 1868, there occurred seven railway accidents in which cars were burned, and a collation of facts made at that time showed that of them five were due directly to the ignition of wood-work from overturned stoves, one from a lamp in which gas was generated from benzine, and one either from sparks from the engine or from the stove—it was impossible to say definitely which. A num-

ber of other casualties occurred during the same period, in which cars were overturned, with kerosene lamps and candles, but in none of them did the cars take fire. The illuminating devices were extinguished by the shock and jar, and consequently proved innocuous for evil. The experience of the half year just cited, which happens to lie in the shape of reliable data before me, may be taken as about that of "year in and year out" in our average railway practice, and justifies the strongest animadversions upon our present methods of car heating. There is, indeed, nothing else in the entire management of railways so far behind its possibilities of improvement.

The most obvious remedy, or, rather, preventive, for the danger mentioned is to make the cars incombustible. To do this with iron involves, however, an entire change in car architecture, and one that will annihilate the ornamental appearance now so much in favor, both with railroad men and with the traveling public, for an iron car must be in a great measure devoid of paneling and gracefully rounded moldings and the like. There is also this drawback, that an iron car has little elasticity, and, consequently, will jar more and "ride harder" than a wooden car, especially at express speed, and passengers, as a rule, are loth to give up comfort for safety. Again, this same inelasticity causes an iron car, when once off the track, to resist with sullen inertia the most enthusiastic attempts to put it back again, thereby introducing a new incidental embarrassment to the al-

many essential conditions, and not by some stroke of genius or lucky thought. Had it been otherwise the problem would have been settled long ago. There is no end to the ridiculous projects for the purpose, some from those unskilled in science, others unfamiliar with the conditions of practice. Illustrations of each may, perhaps, be here admissible.

About three years since the Washington Republican described experiments made in that city with an invention in which "the axle of the car was connected with an apparatus for generating frictional electricity; the current

A similar instance was noticed not long ago by a London journal, but in this the discs were to create heat by friction, much after the manner of producing fire by rubbing two dry sticks together, this heat to be transmitted directly to the interior of the car. One of our city dailies has, within the past week or two, given prominence to the plan, often suggested, for heating cars with exhaust steam from the locomotive. If there was no need to urge the blast in the furnace, the method would doubtless have been long since adopted, despite the annoyance of steam-pipe couplings between the cars. But as Stephenson's success in the introduction of locomotives was due to his improvement of turning the exhaust into the smoke-stack to increase the draft, and this use of the exhaust is all important in train propulsion, the system is not likely to come into very extended use. I may mention, moreover, that it was some time since remarked to me by a prominent maker of road engines, that he could afford to pay ten thousand dollars for any method of forcing the draft which would enable the exhaust steam to be used for other purposes; the purpose more especially desired being its condensation in a surface condenser for use over again in the boiler, in those portions of the remote West where traction steam plowing is most likely to succeed and water is comparatively scarce.

Another plan of heating by steam drawn direct from the steam-pipe of the locomotive has been frequently proposed, but while practicable to a certain extent, is liable to meet with decided objections from engine drivers and others immediately in charge of trains. An apparatus of this kind was lately tried with asserted good results on a branch of the Albany & Susquehanna Railroad. The steam was taken from the dome and through suitable connections conducted to steam pipes ranged in the cars. The pipe couplings between the cars were automatic, and the pipes were also provided with self-acting valves to let off the water of condensation. It must be remembered that steam taken from the boiler is just so much taken from the motive power that propels the train; and if steam sufficient to compensate the drain is to be made extra, there must not only be a greater consumption of fuel, a thing inevitable, however, in any case, but the fire-box must be of greater proportions, or some equivalent means be provided to secure the combustion of a greater quantity of fuel in a given time. Upon the whole, the use of the locomotive boiler for heating the cars should be considered inadmissible, and, even when steam is the heating agent, some separate apparatus, either for cars singly or for an entire train, should be adopted. This is done on the New Haven road by a kind of steam stove, not, I infer, without danger in the event of a smash up. Also in palace sleeping cars on other lines, not, I can certify, without great discomfort from heating over-much in the lower berths, and cold draughts of air in the upper ones.

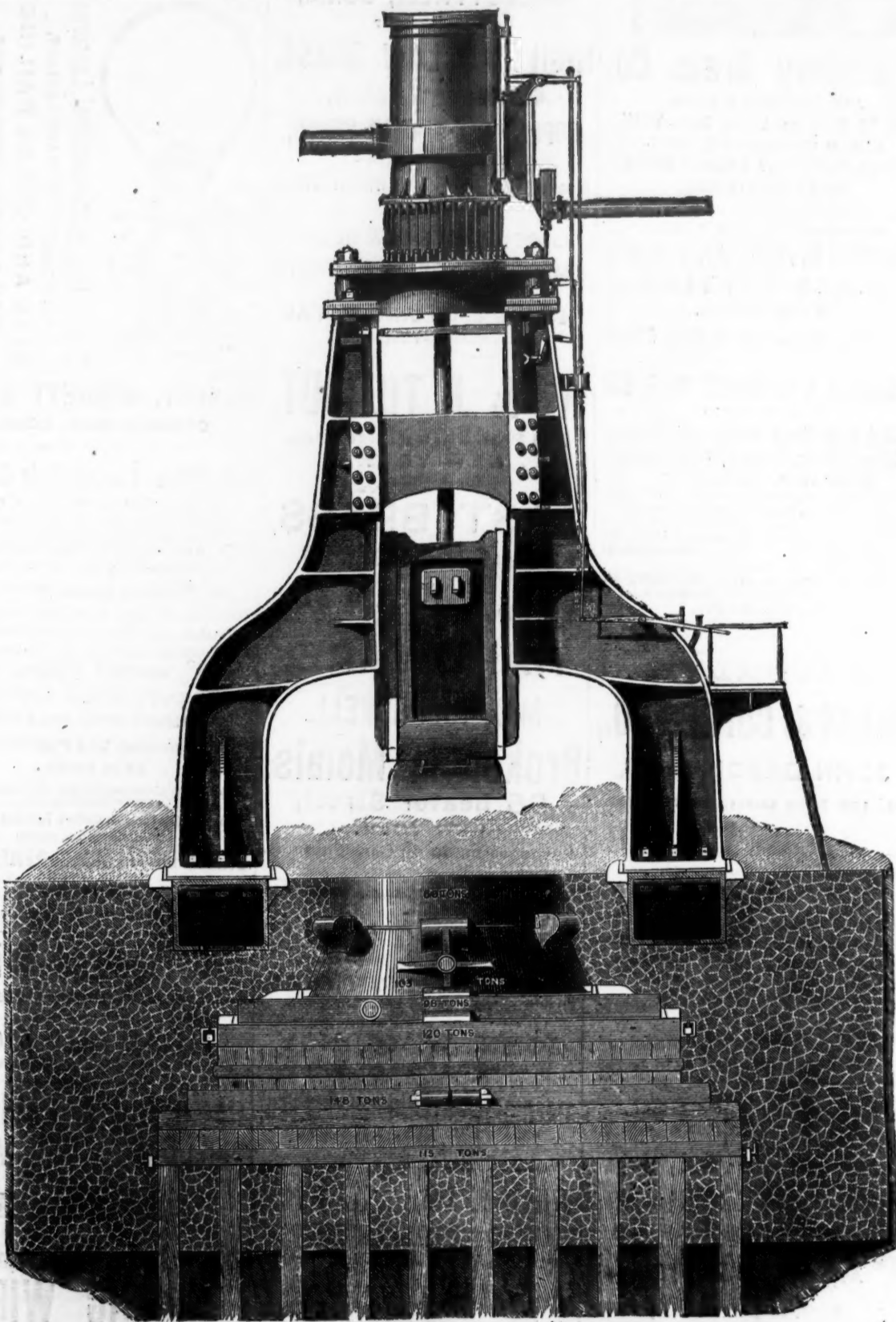
The Old Cumberland Furnace.

Messrs. P. A. & D. V. Ahl have recently purchased the property of Mr. Peter N. Tritt, at Milltown, in this county, the former site of "Cumberland Furnace." They have also bought the farm of Wm. H. Miller, Esq., of which the celebrated "Heller ore bank" forms a part, adjoining the above, as well as a number of other farms and large tracts of timber and mineral lands in the immediate vicinity. These purchases extend for several miles along the Yellow Breeches Creek, and line of the H. & P. R. R., embracing within the limits of the famous "Peach Orchard Ore Mines," amounting in the aggregate to nearly five thousand acres, and reuniting in a great measure, which was formerly in the estate of Thomas C. Miller. The location at this point for iron works is said to be one of the finest in the Valley, and with recent large discoveries of iron ore on these lands, the "Old Cumberland" is destined to more than regain its former glory as an iron producing estate. The investment of the Messrs. Ahl in reuniting this old estate is said to have been over \$100,000.

The "Cumberland Furnace," was built originally about the year 1750, by the elder Michael Ege, who built and owned nearly all the charcoal furnaces in the Cumberland Valley, and who exhibited an amount of skill and judgment in the location of his iron works rarely met with in any age. At his death the "Cumberland Estate" became the portion of his daughter, Mrs. Dr. Chambers. After having been worked by Dr. Chambers for a number of years, it passed into the hands of Gen. Miller, who carried it on until about 1850. Afterward it was worked by Dr. Wm. Mateer for a few years, when it was abandoned as an iron works and sold in parts to farmers and others in the neighborhood.

As an instance of the former imperfect state of the iron system in this county, we may state, in this connection, that during the long series of years that this furnace was worked, the great difficulty was the apparent scarcity of ore; most of which was then taken from small mines, miles away from the furnace, whilst the grounds upon which the works stood were one vast bed of iron ore. Recent explorations and developments have demonstrated this fact beyond a doubt, as all the lands embraced within this estate are rich in iron ore, and particularly that portion immediately surrounding the Peach Orchard and Heller banks.

Whether it is the intention of the Messrs. Ahl to rebuild these works, or merely work the mines for their ore, we have not been informed.



THE WOOLWICH 35-TON STEAM HAMMER.

ready sufficiently complex management of rolling stock. Nevertheless, I am disposed to think that eventually iron and steel will form the standard material of car construction, but the time is not near at hand. One other resource, with the same object, remains, viz.: the chemical treatment of wood to resist combustion. This is perfectly feasible, and would, with good workmanship, secure not only the end in view, but render the cars much more durable than is now the case. The great obstacle is that of expense, which, being once mentioned, nothing on that head need evermore be said. Recourse must, therefore, be had to some simple method of heating which shall not necessitate the overhauling of the entire car, or any material change in car construction.

Unlike some departments of invention, this is one the necessities of which must be met by downright hard thinking, the most logical calculation, and the most comprehensive view of

being sent through a conductor interrupted at intervals by some material of minor conductivity, so that the retard action of the current would heat the conductor." The latter was to be extended underneath each seat, in favorable contiguity to the feet of the passenger. The roundabout way in which the heat introduced to the car by this method would be drawn from the locomotive furnace, is index of the nonsense of the plan. For instance, the burning coal generates steam which operates the engine which draws the car which turns the axle which produces electricity which, by retardation, is converted into heat. This series, showing a chain of circumstances much after the fashion of the "House that Jack built," is really of interest, as showing the transmutation of force from one form to another, but practically is not worth half the space I have given it, were it not a fair example of a large class of devices continually foisted on public notice.

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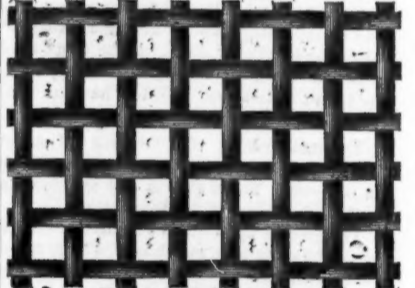
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Removing Boiler Incrustations.

The *Onclida Circular* contains the following interesting account of experiments with tannate of soda to prevent incrustations in boilers: Our ten years' experience with hard water had given us a taste of what we were to expect in future in the line of labor and expenditure, unless some remedy could be found which would effectually check the rapid destruction of our boilers from the deposits of lime. We were having no end of trouble from the leaking and burning of boiler tubes, to say nothing of the increased amount of fuel used, and dangers of explosion which are very much increased by incrustation. We at once ordered a quantity of the necessary material, tannate of soda, and began using it. It required some little time before we could discover any effect produced, owing to the very heavy deposit of hard scale with which our boilers were coated. But in the course of a month we observed that our boilers required less coal to keep up steam, and otherwise seemed to do their work without so much driving. Upon examination we found the tubes perfectly free from scale, and in as good working condition as when first put together.

Last June we started a new 30 horse-power Densmore boiler. This boiler has been in constant use ever since, using nothing but the hardest kind of water. Having occasion lately to open it, we found the tubes perfectly clean and free from scale of any kind. The inventor of the boiler, who was present at the time, was much surprised at the result, and declared he had never seen anything like it before in all his experience in making and using boilers.

In regard to the amount of tannate necessary, much depends upon the character of the water used. At the rate we are now using it the cost per annum is about \$66 for three 30 H. P. boilers. But as we use considerably less during the summer, when we can get more soft water and require less steam for heating, the annual outlay will not be much over \$50.

Now how much do we save by the use of this agent?

In the two boilers at the house we use about \$3500 worth of coal per annum, reckoned at last year's prices, which were below the prices paid any previous year. As near as we can now estimate, the cost of coal used in the Densmore boiler is about \$375 per annum. Now, according to our best authorities on the subject of steam and economy of fuel, a deposit of scale 1-16 of an inch thick will increase the amount of fuel required 15 per cent.; a deposit 1/8 of an inch thick will increase the fuel 50 per cent.; a deposit 1/4 of an inch thick, 150 per cent., and so on. From careful observation we feel warranted in assuming that by the use of tannate of soda in our Root and Phleger boilers we save at least 20 per cent. in fuel; and in the Densmore boiler, which has to use very hard water, 25 per cent. This being allowed, it is plain that \$2500 is 80 per cent. of the amount of coal which we should have used to produce the same results without the tannate; \$2500 at 80 per cent. would be \$3125 as the cost of the coal required in these boilers with a scale less than 1/8 of an inch thick. A saving of 20 per cent. would be equal to \$625 in these two boilers.

In the Densmore boiler we have a present cost of \$375 as 75 per cent. of the cost without the tannate; \$375 as 75 per cent. would be \$500 per annum as the cost of the coal without removing the scale in the boiler. A saving of 25 per cent. would be \$125.

Here then are our figures:

Saving in coal per annum in three boilers.....\$750
Cost of tannate of soda per annum at highest rates..... 66

Balance in favor of tannate of soda.....\$684

To make sure that we are within limits we will call the saving in the two boilers at the house 15 instead of 20 per cent.; and in the Densmore boiler 30 instead of 25 per cent. This would reduce our total amount saved to \$492.

New Patents.

We take from the records of the patent office at Washington the following specifications of certain patents lately issued, which will be found interesting:

IMPROVEMENT IN MANUFACTURING SHEET IRON. Specification forming part of Letters Patent No. 137,585, dated April 8, 1873, issued to W. Dewees Wood, of McKeesport, Pa.

This invention consists in the mode of finishing sheet iron by, first, securing a non-oxidizable surface, in the manner hereinafter set forth; second, rolling and annealing; and, third, hammering in packs while cold.

The iron, after being broken down into sheets by rolling, is cleaned of its scale by acid and alkaline baths, and washed with hot water in the manner usually practiced in the art; or the scale may be removed by other suitable process. The sheets are then immediately placed in a hot-air oven and thoroughly dried, and, while still warm and free from rust, they are plunged into a bath of graphite and oil, or an equivalent mixture of suitable consistency for coating the sheets therewith. The sheets are then rolled in packs of three or more at a good rolling heat. After they are trimmed and annealed they are arranged in packs of, say, from ten to one hundred, more or less, and, while cold, subjected to the operation of hammering over their entire surface. With a system of hammers operating at the rate of, say, twenty to forty blows per minute, a medium sized pack can be ordinarily hammered sufficiently in about ten minutes, more or less, so as to impart to the sheets a polished surface superior to that of the best Russia sheet iron. The graphite and oil may be applied separately, if so desired.

Claim.—In the process of finishing sheet iron, the combination of the following steps: First, coating the sheets separately with a graphite

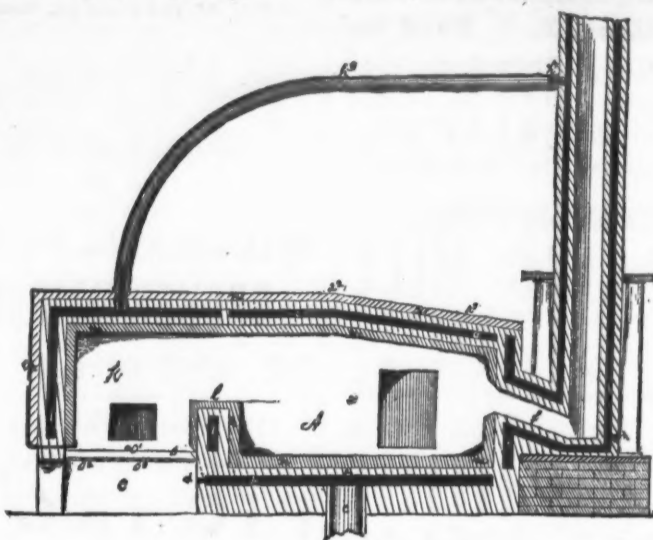
and-oil coating; second, rolling and annealing; and, third, hammering in packs while cold, substantially as set forth.

IMPROVEMENT IN METALLURGICAL-FURNACE LININGS.

Specification forming part of Letters Patent No. 137,554, dated April 8, 1873, issued to Samuel Lansdowne, of Sharon, Pa.

This invention relates to the construction of metallurgical furnaces, and consists in the parts and things hereinafter claimed.

The form and general features of the furnace are the same as those in common use. The frame of the furnace is constructed of cast iron, of which the parts forming the bed, the neck, fire-bridge, and the sides of the fire-chamber are made hollow. Extending through the hearth *a*, sides *a'*, roof *a''*, and jacks *a'''*, is an air-chamber, *b*, into which the air is forced through the opening *c*, and from which it escapes through the opening *d* into the ash-pit *e*. In the sides of the neck *f* and stack *g*, which are also made hollow, is a second chamber, *h*, into which water is admitted by a suitable



IMPROVED METALLURGICAL FURNACE.

opening *h'*, and in which it is heated. After being heated it passes out the opening *h''* and through the pipe *h'''* forward to a third chamber, *i*, which extends throughout the hollow sides and top of the fire-chamber *k* and the fire-bridge *l*. This chamber is in reality a steam-generator, in which the water, previously heated in the chamber *h*, is turned into steam, after which it is taken off by a steam pipe to a drum to be used for operating an engine, or for any other desired purpose. The outer surface of the top, jacks, and back of the furnace, and the inner sides of the fire-chamber, are lined, as at *m*, with a composition consisting of cement, Kentucky clay, fire-brick dust, and sand, in equal or nearly equal parts. These ingredients are mixed with water to the consistency of mortar, applied to the parts named, and allowed to dry by a gentle heat, when the covering thus made will last a long time, but must occasionally be renewed in the fire-chamber. The inside of the bed is lined as at *n*, with a composition consisting of Missouri iron ore, Lake Superior iron ore, Port Entry iron ore, limestone, and charcoal cinders, all pulverized and mixed together with water in equal or nearly equal parts to the consistency of mortar. The whole inner surface of the bed *A* and neck *f* is lined with this composition, which is greatly superior to fire-brick or tile for this purpose, since if the brick is exposed it melts down into the iron and spoils the whole heat, while if this does melt the ingredients are such as will not injure but rather aid the quality of the iron. The grate-bars *o* are mounted upon a turning bar or pivot, *o'*, which is operated by a crank. The purpose is to agitate or shake up the fire thoroughly, so as to accelerate combustion, to break up the clinkers which are formed therein, and to aid in the operation of cleaning out the grate. In the grate-bars *o* are a series of openings, *o''*, which are for the purpose of letting air up through them into the fire.

Air from the chamber *b* is admitted through the opening *d* into the ash-pit *e*, from whence it ascends and forms a draft into the fire-chamber *k*, causes a more vivid combustion and greater heat. By this arrangement it is possible to utilize coal containing a considerable percentage of sulphur, which has heretofore been totally unfit for the purpose. For this purpose the sulphurous coal-slack is mixed with good coal and both are placed in the fire-chamber. The draft or blast from below drives the sulphur, when eliminated, off through the opening *p*, which is partially closed with a piece of coal. This furnace requires fixing when used, the lining described being simply a substitute for a brick lining.

The principal functions of the chambers *b*, *h*, and *i* are to cool the parts through which they extend so as to keep them from burning. By means of the water chambers *h* and *i* the heat is utilized, which otherwise would be waste, and at the same time steam is generated with but little cost.

Claim.—1. A chamber, *h*, in the neck and stack of the furnace, communicating, by a pipe, *h'*, with the chamber *i*, arranged and combined substantially as and for the purposes set forth.

2. A furnace lined on its exterior, as at *m*, and in the fire-chamber with a composition consisting of cement, Kentucky clay, fire-brick dust, and sand, prepared with water, substantially as described.

3. A lining for furnaces, &c., consisting of cement, Kentucky clay, fire-brick dust, and sand, prepared as described.

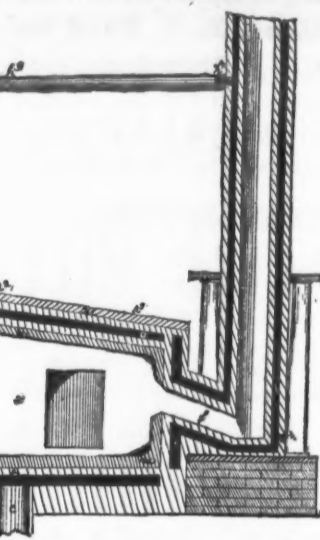
4. A lining for the insides of furnaces, consisting of Missouri iron ore, Lake Superior iron ore, Port Entry iron ore, limestone, and charcoal cinders, prepared substantially as described.

IMPROVEMENT IN RECOVERING TIN FROM WASTE TIN SCRAP.

Specification forming part of Letters Patent No. 137,713, dated April 8, 1873, issued to Henry Pantan, of New York.

This process consists in first reducing the bulk of the scraps, which, in consequence of the irregularity of their shape and the disorder in which they are thrown together, occupy much room in proportion to their weight. This is accomplished by cutting them into small pieces, or chips, by means of such machines as are employed for cutting scraps of dry leather, rags, roots, &c., preparatory for a finer division. The only alteration of such machines required is that they be of heavier and more substantial construction.

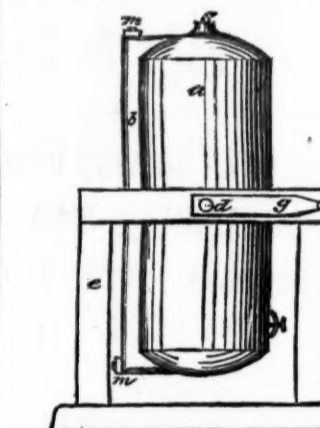
A machine which answers the purpose well consists of a box five feet long, one foot wide and one foot deep, mounted on a frame two and a half feet high, having a steel plate with a cutting edge fastened to its bottom at one end, and another steel plate with a cutting edge adjusted and fastened to a frame work, which, by



APPARATUS FOR RECOVERING TIN FROM WASTE TIN SCRAP.—Fig. 1.

means of a lever, is lifted and forced downward. This steel plate is set so that it acts obliquely to the plate fastened to the box, forming a shear. The scraps, therefore, when placed in the box and crowded forward, are cut into any desirable dimensions. Secondly, in placing these chips at a summer temperature, or a little higher degree, in a receiver of peculiar construction, shown in Fig. 1, for further treatment with mercury.

Fig. 1 is an exterior view of the receiver; and Fig. 2 is a vertical section of the same, showing the interior arrangement.



APPARATUS FOR RECOVERING TIN FROM WASTE TIN SCRAP.—Fig. 1.

iron band, having two journals, *d*, projecting, which rest in appropriate boxes on a frame, *e*. To the ends of the journals are attached cranks *g*, by which the cylinder is turned. Within the cylinder *a* are two partitions, *h*, one at each end, perforated with small holes, forming a kind of strainer. Both of these are concave to the

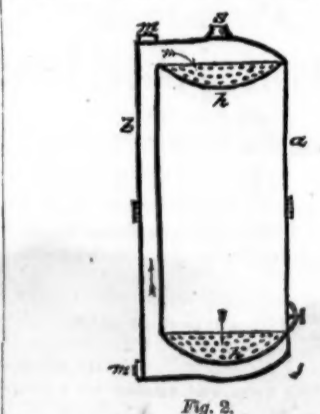


Fig. 2.

upper or top end of the cylinder. At the lower end is a round man-hole, one foot across; and at each end of the pipe are screw stoppers *m*, *m'*. At the top of the cylinder, firmly attached to it, is a small anvil, *s*, of solid iron.

This apparatus is made wholly of either cast or wrought iron, and consists of a cylinder, *a*, five feet long and two feet diameter, having convex ends, and a pipe, *b*, three inches diameter, parallel with and close to its outer side, leading, by means of two elbows, from the interior of one of its ends to the interior of the other end. Around the center of the whole is an

About 300 pounds of the small chips of scraps are placed in the cylinder through the man-hole, the cover of which is adjusted, packed with leather, and firmly fastened by a screw. The upper screw stopper *m'* is then unscrewed, and 40 or more pounds of mercury are poured into the pipe, when the stopper, packed with lead

ther, is again screwed fast. The cylinder is then slowly revolved in the direction opposite to that indicated by the arrows in Fig. 2. The mercury circulates in the direction of the arrows—that is, as the lower end of the cylinder rises the mercury falls into the pipe; and when it has become reversed in position the mercury has, by its weight, entered the then lower chamber, where the larger portion of it remains until it has been turned to the top, when it falls through the perforations to the scraps, where it scatters and percolates through them, amalgamating with and carrying the tin to the bottom, when it passes through the perforations of the lower partition to the chamber beneath it. By the next revolution it traverses the circuit again, and thus the circuit is repeated until the tin has been wholly separated. The lower stopper *m* is then taken out, and the mercury, with the tin, removed.

The cylinder, at the commencement of the process, is revolved slowly to allow time for the mercury to fall from the upper chamber and saturate the tin on the surface of the scraps, which requires about 10 minutes. It is then turned more rapidly for an equal duration of time, so as to thoroughly agitate the scraps. Then during a half hour it is revolved after intervals of about five minutes. It is next allowed to stand, with only an occasional blow with a hammer on the anvil *s* at the top of the cylinder, which removes and settles any adhering mercury. The mercury is not removed until it begins to lose its fluidity. This is determined by occasional examinations. It may be removed at any stage of treatment of a batch of the scraps, and fresh mercury substituted.

The scraps are removed by opening the man-hole and turning the cylinder so that they will fall into a box placed to receive them. The tin is separated from the mercury in the manner usually practiced for separating it from other metals, as by distillation, or by oxidation of the tin. In a few cases—where the waste scraps are found to be oily or greasy—it is better to first wash them by a solution of soda, which may be done in the same apparatus before treating them with mercury.

The advantages of this process over others consist in its simplicity, metallic tin being obtained by mechanical means almost wholly, with the exception of that of a simple distillation for ultimately separating the tin from the mercury; the compactness of the apparatus required, and the comparative little cost of its structure. These are considerations of great importance, as it is desirable to work the scraps in towns removed at a distance from the market, where relatively small quantities are made, and which would otherwise not be utilized, as their great bulk, compared with their weight, prohibits their being carried to distant centers. By this process they may be reduced in bulk, treated at the locality, and compactly packed in barrels or boxes, and removed to the nearest steel works, placed in crucibles with the usual ingredients employed for forming steel batches, and converted and melted into steel.

Claim.—1. The process herein described of utilizing waste tin plate scraps by first reducing them to small chips by the means described; secondly, treating them with mercury in the manner explained; and, thirdly, converting the chips of iron, after such treatment, into steel, in the manner set forth.

2. The apparatus described for treating tin scrap, consisting of the revolving vessel, *a*, provided with the perforated diaphragms, *h* and *h'*, and side pipe, *b*, so as to return the mercury and distribute it over the scraps, as described.

Extinguishing Fires.—The *Journal of Chemistry* gives the following adaptation of an old and familiar principle to a new mode of usage for putting out fires. It may be well worthy of the attention of warehousemen. The plan is to place in the basement of every warehouse or store an iron vessel resembling a steam boiler, the capacity to depend upon the size of the building. This is to be kept two-thirds full of water; the chamber above the water to hold two glass vessels, one of which is filled with acid, the other with bicarbonate of soda. By a very simple device these glass vessels may be broken at any moment, so that the substances will instantly develop carbonic acid, which, being absorbed by the water, changes it into aerated acid water. The gas over the water affords immense pressure, and, by pipes leading from the strong iron fountain, the gas-impregnated water may be directed at once upon the fire, in its incipient stages, in any portion of the building. One gallon of this is effective as ten of common water, and, therefore, can be used to extinguish a fire, without the great water damage to goods which often result.

A writer in the *St. Louis Democrat* thus happily caricatures a class of inventions which are frequently brought to the public notice with a great flourish of trumpets and enthusiastic newspaper commendation: A gentleman in this city has invented a little machine for removing the shells from chestnuts and peanuts. It is made to fit over the nose, the breath passing from the nostrils furnishing the motive power. The nuts are dropped in the hopper on top, and the meat or unshelled nut is dropped into the mouth of the eater below. It is noiseless in its working, and gentlemen or ladies who have been debarr'd from attending Theodore Thomas' concerts, or church, because they were not allowed to "crunch" nuts, can now experience a new pleasure.

Smith's vacuum brake has recently been applied to a train on the Connecticut River Railroad, and the New Haven *Palladium* says that it worked very successfully, and that probably it will be applied to all the engines on the road.

The New England Awl and Needle Company, at West Medway, Mass., made 3,000,000 awls last year. They are made by machinery from wire imported from England.

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Mr. I. Lowthian Bell on The Manufacture of Iron and Steel.

The newly elected president of the Iron and Steel Institute, Mr. I. L. Bell, has signalled his accession to the chair by an inaugural address of unusual interest, delivered at the annual meeting held April 29th, a copy of which we have received. Our limited space prevents our giving more than a part of it this week:

GENTLEMEN: My distinguished predecessors in this chair have followed the example of presidents in similar institutions to our own, by delivering an address upon their entering upon the functions of their office. Before undertaking a duty thus imposed upon me by custom, allow me, in all sincerity, to tender my very grateful thanks to the members of the Iron and Steel Institute, who have placed me in a position filled successfully, and filled so ably, by his grace the Duke of Devonshire and by Mr. Bessemer. After some further preliminary remarks, Mr. Bell continued: In this kingdom alone there are at work something like 700 blast furnaces for smelting iron, and about 7000 puddling furnaces for transforming the metal into its malleable state. Add to the proprietors and officers of higher grade connected with these undertakings those occupied in our steel works, foundries, engineering and divers manufacturing and professions to whom iron is a necessity, and the persons to whom the knowledge we seek to cultivate ought to be an object of the highest moment must be estimated by thousands. There exist here and there instances of that disregard for scientific inquiry which is a natural consequence of no inconsiderable success in our vocation, effected independently of all philosophical research. With such, practical experience, as it is termed, is the only rule admitted as a guide. But what is practical experience but science of a kind—it is the observation, and, to some extent, the connection of certain facts; science, however, so constituted is often incomplete in its links, its conclusions are frequently erroneous, and the consequence of its application has often been great loss and grievous disappointment. On the other hand, abstract science, correct as it may be in every step employed in its elaboration, when introduced into the workshop may be unable to stand the rude but inevitable test of commercial practicability. If so, then all efforts to raise its object to the position of an industrial enterprise must be useless. It is, therefore, clear that if we would avoid the failure of what may be designated unscientific practice, or the failure of impracticable science, we must seek to combine commercial intelligence with a knowledge of those natural laws which form the only trustworthy groundwork of the complicated processes in which we are engaged. Now, there cannot be a more convenient method of effecting a sound union between these two great principles than that afforded by such an organization as the Iron and Steel Institute, in which are brought face to face men, some distinguished for their practical knowledge, and others equally eminent for their attachment to scientific observation. Facts, as such, may be completely established, and yet very delusive inferences may be deduced from their existence. Thus, forty or fifty years ago, it was well known that in winter a blast furnace did more work, and often with less fuel, than it was capable of accomplishing in summer. It was not unreasonable to ascribe this alteration in efficiency of duty to some supposed virtue possessed by cold air in smelting iron, which virtue was less conspicuous when the blast was admitted at warmer temperatures. It was this view of the cause of the difference which led some manufacturers to deny the merit of the hot blast. Now, every one, of course, knows that a blowing engine supplies a greater weight of air when its volume is condensed by cold, and that, as a rule, it delivers its blast more free from moisture when the temperature of the atmosphere is below the freezing point of water, the presence of the latter occasioning a considerable and useless absorption of heat, and, of course, a corresponding waste of fuel. Again, so far back as 1841, Ebelmen examined and published his researches on the composition of the gases emitted by the blast furnace. These investigations were followed up by others of a similar nature by Bunsen, Playfair, Turner, and others. The true importance of the assistance rendered by these labors undertaken by men of science, seems at the time to have been disregarded by iron manufacturers. Nevertheless, they contain information of the highest interest in connection with the economy of fuel in the smelting process. It will be in the recollection of earlier members that at our inaugural meeting our first president gave us an interesting account of the history of the iron manufacture from the remotest times down to the present day. It would be impossible, in the absence of any trustworthy record, to allot, even during the last three centuries, to each nation the proper amount of credit to which it is entitled for aid rendered in advancing this branch of metallurgy. So far, however, as concerns the production of iron, and its application to those purposes which have rendered it a necessity of civilized life, we need not go back beyond 1806, when the production of pig iron in this country did not exceed 260,000 tons. We have very recently been again warned of the present aspect of foreign competition. It is said that this threatens, as it did ten years ago, if not to extinguish, yet seriously to cripple a trade which has occupied a very honorable and conspicuous position in our manufacturing annals. Doubtless, the progress made in other lands has been more marked during the last 20 or 30 years than in our own case, but the change has arisen from a rapid adaptation of our appliances, and not from any important discoveries abroad. Until, indeed, we are made acquainted with a series of improvements equal to the puddling process, the substitution of the rolling mills for forgo hammers,

the hot blast, and our last grand achievement of Bessemer steel, we must permit our national pride the luxury of believing that it is to ourselves, more than to any other people, that the world is indebted for the advance which enables it to be furnished with cheap iron. In striving to attain economy in production, our manufacturers have not been insensible to the importance of being able to furnish the metal in which powers of great resistance are not incompatible with comparative lightness. Had this been overlooked, the high speeds of our express trains would have been fraught with danger, marine engines could never have been compressed in the small space they now occupy, and no one would have dreamt of throwing a projectile of 600 or 700 lbs. weight for a distance of five miles from a gun made entirely of English iron. Recognizing, as we all do, the value of inductive reasoning, it certainly is a matter of surprise how great the progress has been in the iron industry of this country, made independently of all scientific teaching. This advance has been probably due to the opportunities of experiment which have been afforded by an enormous trade, fostered by great capital and by almost unlimited natural resources. To judge correctly of the nature of the growth, which has culminated in the present wonderful expansion of this branch of manufacture, we should have to arrange alongside of our brilliant successes a list of our costly failures, or of the irrational patents of so-called improvements in the manufacture of iron and of steel. Had we, as a nation, been a little more systematic in our methods of study, it is possible some of the fruitless attempts at improvement made by ourselves might have been avoided, and less time and money lost in endeavors to render assistance to others who had neither science nor practice to guide them.

THE IRON TRADE AND THE COAL FAMINE.

Leaving our past history, and directing our attention to events as they now are passing before us, there is nothing more certain to arrest it than the extraordinary disturbance in our position as iron manufacturers occasioned by the recent greatly altered value of fuel. Having regard to the large quantity of coal burnt in producing a railway bar, it is not too much to say that if anything like the former average price of ordinary pig iron—viz., about 60 per ton, were to prevail, the iron trade of this kingdom would, with fuel at even half its present price, commence to decline. This was exactly what did happen when timber grew scarce, and was worth more for other purposes than that of smelting. Of course, any process of partial extinction as that supposed possible would be very gradual, the weaker districts succumbing in the first instance. The very diminution in the production of iron would of itself liberate so large a quantity of coal as would tend to restore an equilibrium in the price of this element of consumption. This is obvious when it is borne in mind that out of 107½ millions of tons of coal raised in this kingdom in 1869, 32½ millions were devoted to the manufacture of pig and malleable iron. In the year 1863 the make of the former, in Great Britain, was close on four millions of tons; in 1872, it was probably 6½ millions of tons. At this rate of increase, in 1882, it ought to reach about 11½ millions of tons, and for this, and the probable extension of malleable ironworks, judging by the experience of 1869, something like 65 million tons of coal might be required. Alongside of this tendency to increase which has marked the history of the iron trade, it is only fair to assume that other sections of British industry would not remain idle in this respect. Under such circumstances, it becomes important that we should consider how far our coal fields would be able to meet any greatly increased demand on their resources for an article which is more or less a necessity for almost every variety of manufacturing enterprise. It is not my wish to weary you with statistical details, because the erection of new mills in the cotton and woolen districts, the extension of our railways, the substitution of steam for sails in navigation, inform us that the same activity which prevails in the iron trade is also on all sides adding to any difficulty which an inadequate supply of coal must entail upon ourselves. On all hands it is admitted that the increase in the yield of our collieries has recently been below that of the fresh demands it has had to satisfy. In my opinion, an important addition can and will be made to their present output; but it is very possible that the time is approaching when any extension of manufacturing operations in this country will have to be regulated, not by the requirements of society for their produce, but by the means our coal mines possess of furnishing the fuel required. It must not, however, be supposed that the recent very rapid rise in the price of coal has to be accepted as presenting any standard by which we can estimate the extent of the actual deficiency. As is well known, a very moderate shortness in the supply instantly makes itself felt in the market, and this shortness happening when almost every description of manufacture was in an unusually active state, the effect on the selling value of coal and coke has assumed a highly exaggerated form. In like manner, the moment the demand falls or even is expected to fall, a trifle below the powers of production of our collieries, we may expect to experience a very notable diminution in the price of these commodities. My own impression is that an addition of less than five per cent. to the quantity of coal raised during the past year, would, in all probability, have sufficed to keep in check the exorbitant prices it has commanded in the market; but in the meantime our own trade, owing to the magnitude of its consumption, has upon certain occasions been regarded as the chief cause of the recent and present scarcity. It will, I think, be found on inquiry, that the iron and steel works have not, during 1872, used much more than their usual proportion of the total output, i. e., instead of burning, as in former years, 20 to 30 per cent. of the gross produce of

the collieries, the quantity consumed may have reached 33 per cent. of the whole. However this may be, it behooves us, after our recent experience, to reflect on our position in the event of a continuance or a recurrence of any great competition for so essential an element in our operations as coal. It is obvious, in such a case, that industry will suffer most into which the cost of fuel enters most largely. Now, roughly, according to the figures in the report of the "Royal Commissioners appointed to inquire into matters relating to coal," every 1000 tons raised in this kingdom is disposed of as follows:

In paper making and tanning.....	6
" smelting copper, lead, tin and zinc.....	8
" water works.....	14
" breweries and distilleries.....	18
" chemical manufactures.....	19
" railway work.....	20
" steam navigation.....	30
" articles of clay and glass, and limekilns.....	31
" textile fabrics—of wool, cotton, silk, flax and jute.....	42
" gas works.....	42
" mining operations.....	60
" coal exported to foreign countries.....	92
" general purposes, chiefly steam engines.....	121
" domestic use.....	173
" iron and steel works, inclusive of that required for their steam power.....	300

Hence it would appear that the iron trade of this country requires for its prosecution as much coal as any two of the largest sources of consumption, and between seven and eight times that of textile fabrics, one of which, alone, viz., cotton, is regarded as the most important in point of money value of all our manufactures.

THE WASTE OF COAL IN IRON MAKING.

The mere extent of any industrial undertaking can scarcely be regarded as being detrimental to the national well-being, even although it involves the destruction of the vast weight of coal just mentioned as being set aside for the ironworks of the country. The case, however, is materially altered if it can be proved that the fuel we employ is greatly in excess of that which is really necessary, and beyond that which actual experience has been proved elsewhere can be made to suffice. An opinion has been expressed in high quarters that the British iron makers are accountable for a willful waste of national wealth by their reckless expenditure of coal; indeed, only a month or two ago, a Minister of the Crown informed the world from his place in Parliament that he had "conversed with an intelligent gentleman connected with the iron trade, who had traveled in France and Germany for the purpose of comparing the different modes of production and manufacture, and no one circumstance struck him so much as the difference between the economical use of coal in France and Germany, and its wasteful consumption in this country." I intend, in the time you have been so good as to place at my disposal, to consider how far we have laid ourselves open to this reflection upon our manufacturing skill and intelligence. In thus examining the fuel consumed in some of our processes, and comparing our position in this respect with that of other nations, I propose to avail myself of the opportunity to offer a few observations on some questions connected with the processes themselves, which possess a high degree of interest at the present moment. The natural starting point in such an inquiry as that contemplated is the blast furnace, because, whatever the ultimate product sought for may be, it is the first step in the routine of our operations; and, secondly, because of the whole quantity of fuel required in the iron trade, it alone absorbs one-half. In the gradual improvement of this very important item of the iron masters' plant, this country may be said to stand without a rival; indeed, with the single exception of the use of the waste gases—no doubt a most valuable discovery—every step in the march of amelioration is due to British skill. For more than half a century after Darby succeeded in introducing Dudley's plan of substituting mineral fuel for charcoal, the blast furnace may be said to have remained in a stationary position. This was the state of affairs when Neilson, 50 years after Darby's time, enabled us gradually to quadruple the make of a furnace, and reduce the consumption of coal on the ton of iron to less than one-half of its previous amount. Some 10 or 15 years ago, and about 30 years after the date of Neilson's hot blast patent, the smelters of the North of England, disregarding the failures which had accompanied former attempts at enlargement, added by degrees to the height of their furnaces until it was nearly doubled. At the same time their attention was directed to a further increase in the temperature of the blast employed in the operation. These two improvements effected a saving of fully 35 per cent. of the fuel previously consumed, and each furnace was enabled to run 400 tons, instead of half this quantity, per week. When it is remembered this change was effected in a new district where there was not a work much above a dozen years old, and that in an incredibly short space of time about 40 furnaces were demolished and others erected at double their cost, it cannot be maintained with any justice that indifference to the economy of fuel is a reproach that can be laid at our door. This is rendered more conspicuous by the fact that the great outlay in question upon plant was incurred when coke was less than one-third of the price it now commands. Reduced into figures, it may safely be stated that with the perfect mode of withdrawing and utilizing the gases, and the improvements in the furnace just mentioned, the present make of pig iron in Cleveland is produced with 2½ million tons of coal less than would have been needed 15 years ago. This is equivalent to a saving of 45 per cent. of the quantity formerly used.

[To be Continued.]

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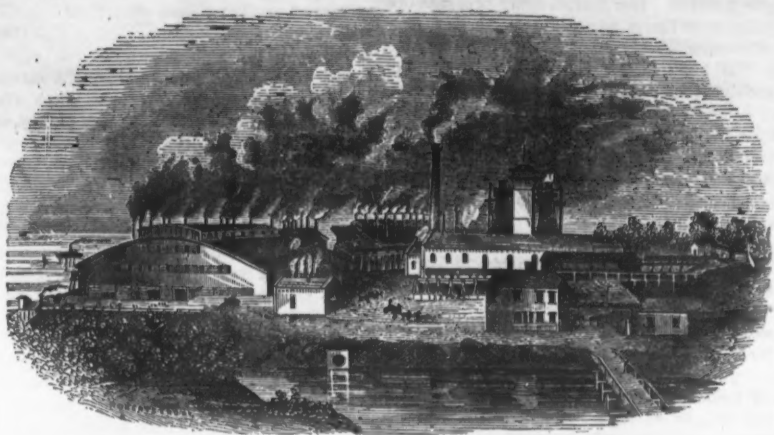
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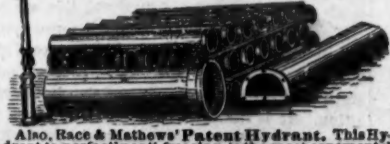
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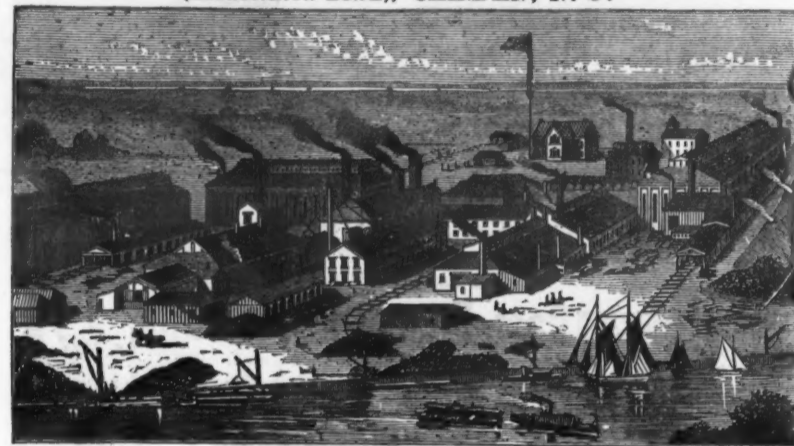
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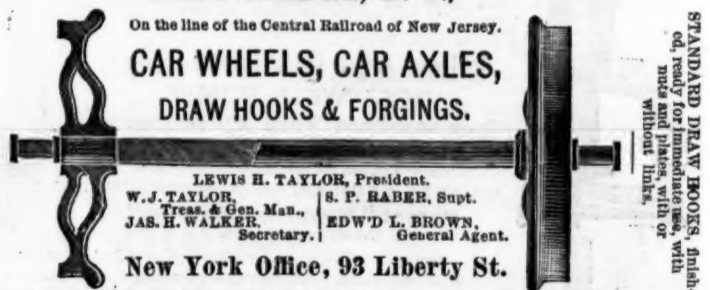
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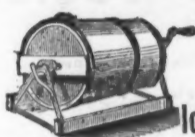
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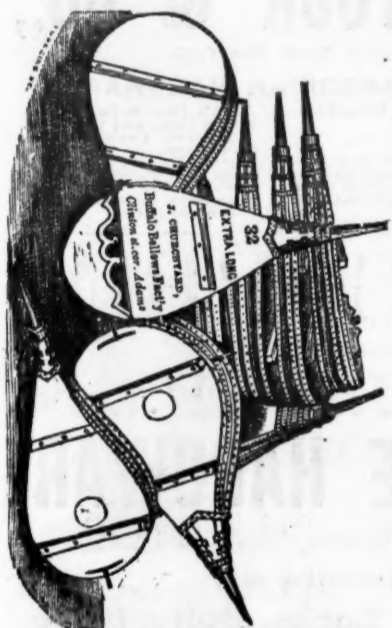


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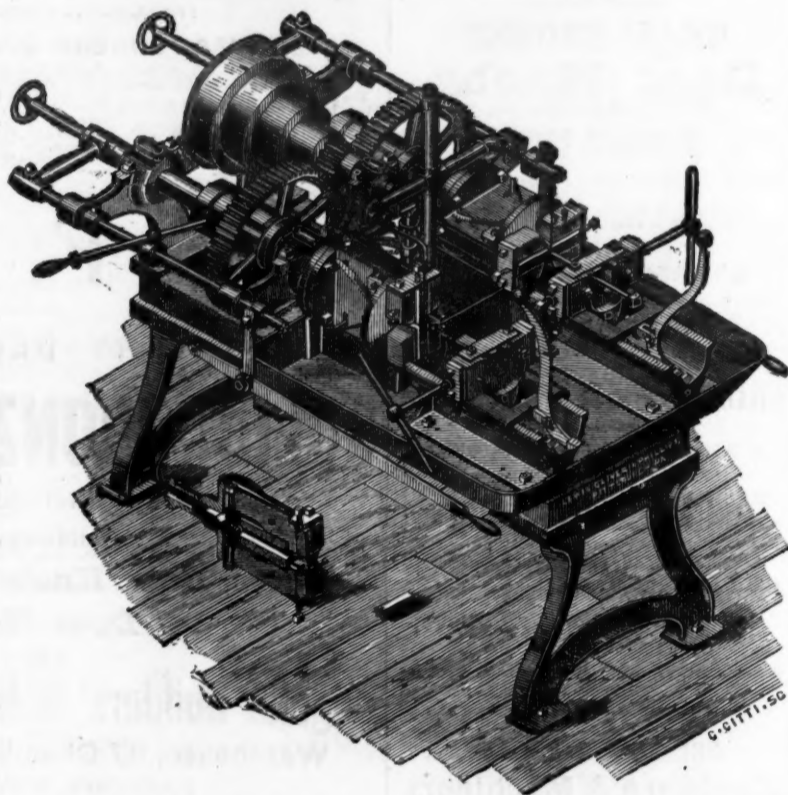
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FOOTE'S PATENT LOCK UMBRELLA STAND**The Chemical Constitution of Steel.**

There is still considerable diversity of opinion among scientific metallurgists regarding the chemical constitution of steel. What elements belong essentially to its composition and which not; in what manner the several substances are combined with each other, and in which form of combination they effect the production of steel; all these and other questions have given rise to lively discussions, especially among French chemists, and are yet to be definitively decided. Chemical analyses, as well as the formation of steel from wrought and pig iron, indicate that iron and carbon must be considered as its most essential ingredients; but, beside, there are found in it in smaller quantities various elements of an electro-positive and electro-negative nature, such as silicon, sulphur, phosphorus, chromium, arsenic, copper, manganese, wolfram, titanium, etc., which partly originate from the pig iron or have been added to improve the quality of the final product. Hence, steel consists as little as pig iron of a pure carbonized iron, but contains also smaller quantities of various other chemical combinations. These secondary ingredients exert either a perceptibly injurious or favorable influence upon its texture and properties of hardness, strength, weldability, elasticity, etc.; but as they vary according to nature and quantities, and are sometimes scarcely to be detected, or are not present at all, without the steel losing its character, as is the case, however, with an increase or decrease of the carbon, we are not entitled to consider these bodies of equal importance as the carburets of iron.

In opposition to these views, Frey maintains that steel is a compound of carbon, nitrogen and iron, in which carbon as well as nitrogen can be replaced by certain other bodies, so that, as already maintained by Chevreul, there would be many kinds of steel of different compositions, and among them such that contain no carbon. Concerning this hypothesis, however, we do not possess as yet any reliable analytical proofs.

The quantity of carbon necessary to produce steel varies between 0.65 and 2.3 per cent. When containing less than 0.65 per cent. the product cannot be hardened any more, and then constitutes wrought iron; while, on the other hand, it becomes pig iron when exceeding 2.3 per cent. carbon. Yet these figures have rather a theoretical than a practical significance, as the amount of carbon of the ordinary kinds of steel varies between narrower limits, viz.: between 0.7 and 1.9 per cent. Karsten found in crude and cast steel from 0.9 to 1.9 per cent., in cementation steel never more than 1.75 per cent. According to Mayrhofer, hard crude and cast steel contain 1.84 per cent.; cast and refined steel, too brittle for wires and springs, was found to contain from 1.58 to 1.11 per cent.; elastic cast and refined steel from 1.11 to 0.70 per cent.; soft puddling steel and steely or fine grained iron, 0.62 carbon.

The carbon is either chemically bound or separated to a smaller part as graphite. Gurit considers steel as a mixture of metallic iron and iron containing 1/2 of carbon (Fe₂C); Tunner, as iron with the compound Fe₃C; Lohage, starting from the supposition that the molecule of carbon is a regular octahedron, considers it probable that by juxtaposition of iron molecules to the corresponding faces, or (according to the law of formation of the tetrahedron) to the alternate surfaces of the carbon octahedron two different series of iron carburets may be formed. Those with a stable equilibrium of the tetrahedric molecules, Fe₃C, Fe₂C, Fe₂C, represent compounds which can be hardened, while those with unstable equilibrium of the octahedric molecules, Fe₃C, Fe₂C, Fe₂C, represent compounds that cannot be hardened.

The hardening of steel and the conversion of gray pig into white pig iron by rapid cooling is supposed to be owing to the fact that the decomposition of the compounds liable to be hardened is prevented.

Mayrhofer established the following chemical formulae for various brands of steel:

	Fe	C
Hard crude and cast steel	98.16	1.84
Cast and refined steel, not for	98.43	1.57
well applicable to springs	98.61	1.39
and wires, owing to its	98.77	1.23
brittleness	98.89	1.11
	98.99	1.01
	99.06	0.94
Cast and refined steel, well	99.14	0.86
applicable to springs and	99.20	0.80
wires, owing to elasticity	99.25	0.75
	99.30	0.70
	99.34	0.66
Soft puddling steel and steely	99.38	0.62
iron		

Silicium forms a regular constituent of steel, though occurring only in very small quantities. According to Schafhaout, it is combined with the carbon to carbide of silicium, and every good steel, in order to be liable to be hardened, should contain a certain amount of it. But, if the congruity of silicium and carbon with regard to their crystalline forms, as established by recent researches, is considered, as well as their affinity to the metals, a combination of both elements in steel has little probability, and it must rather be supposed that they replace each other in steel as well as in pig iron. According to all the facts known, it is generally agreed upon that silicium imparts greater hardness and brittleness to steel, diminishing also its strength when present in about 0.05 per cent. and more. The pure compounds of silicium and iron being yet insufficiently known, and since the observations on this subject contradict each other, it is yet doubtful whether silicium is capable of exerting such an influence. I would remark that the compound of silicium and iron prepared by Hahn, with 10, 20 and 31 per cent. silicium were, exceedingly hard and brittle, while Berzelius, on the other hand, mentions that a silicium iron which, on dissolving in muriatic acid, yielded 19 per cent. silicic acid (corresponding to 8.8 per cent. silicium), was soft and could be hammered into thin foils.

Sulphur and phosphorus exert on steel essen-

tially the same influence as on wrought iron, producing either red-short or cold-short steel. Eggertz found in good kinds of steel only from 0 to 0.013 per cent. sulphur; of phosphorus from 0.01 to 0.02 per cent. Both contribute to the weldability. Phosphorus imparts to it a fine, brilliant white grain and the property to attain a high polish.

Arsenic, according to Schafhaout, in small quantities, renders steel fine-grained, hard and solid; in larger quantities, red-short. In hammering the best English cast-steel, prepared from Dannemora iron, he observed sometimes a very strong arsenical smell; he therefore ascribes the superior quality of Swedish iron partly to a certain amount of arsenic iron.

Regarding the presence of nitrogen in steel, on which Frey lays especial stress, it ought to be stated that the quantities found are so small that it is scarcely possible that it could take an essential part in the constitution of steel. Marchaud, by his investigations, arrives at the conclusion that it is not conclusively proven that cast iron and steel contain nitrogen. Bouls, by conducting dried hydrogen over glowing steel, found as maximum in wootz steel 0.00673 per cent. nitrogen, and Bousin-gault, by another method in various specimens of cast steel, 0.007 per cent., 0.042 per cent., and 0.057 per cent.

Copper acts detrimental, and, according to Stengel, as well as Eggertz, a fraction of a few tenths of a per cent. renders steel cold-short. The latter found in Dannemora iron, which is especially valued for the making of steel, only 0.03 per cent., and in various other varieties of steel 0.2 per cent.

Chromium is said to exert an exceedingly valuable influence on steel, but no analyses of such steel are known to me.

Manganese, wolfram, titanium, aluminium, nickel, rhodium, osmium-iridium, platinum and silver are also said to improve steel. There is no doubt that some of these substances, when passing in a remarkable quantity into steel, exert such an influence, but others, which either are only met in traces, or not at all, have either only an indirect purifying effect, or are entirely useless. It is often the case that people ascribe to their presence what has only been a consequence of remelting and of a further working of the steel. Of the last named metals the manganese is the most important.

According to all observations manganese ores, especially apathic ores and pig iron produced therefrom, are most suitable for the manufacture of steel, and in fining, puddling in the Bessemer process, and in remelting steel, manganese fluxes render excellent service. It should be observed, however, that the influence exerted by the manganese is chiefly an indirect one. While, on the one hand, it passes mostly into the slag, on account of its property to be easily oxidized, and often only in traces into the iron itself, it retards, on the other hand, decarbonization, favors essentially the separation of silicium, sulphur and partly phosphorus, and produces a readily fusing slag, which attacks the walls of the furnaces but little, protects the steel from rapid oxidation, thus rendering the steel more solid and of easier weldability. The latter fact is very important, as steel must be worked at a lower temperature than wrought iron. The most suitable form in which manganese can be used are manganese pig iron (spiegeleisen) carbide of manganese, or an alloy of manganese and iron. Added in the oxidized state, as black oxide of manganese, it soon forms a silicate or protoxide of manganese, and acts then, decarbonizing by yielding oxygen.

Wolfram alloys with iron, and passes there fore into steel, as proven by the analyses of Sauerwein, Siewert, and Rammelsberg, who found in the respective kinds an amount of from 0.9 to 7.43 per cent. The Duke of Luynes, as early as 1844, used wolfram for the manufacture of Damascus steel, and called attention to its occurrence in the celebrated blades of Damascus; later (in 1855) it was applied in Austria, England, and France. Wolfram steel distinguishes itself by a very dense texture and a conchoidal silky fracture, by great hardness and strength, and can easily be welded with wrought iron; according to Appelbaum, it requires a greater heat than English cast steel. Rossler found it less suited for mint stamps than Krupp's cast steel, owing to the readiness with which it cracked. However, this steel has not found the general application it was supposed to attain, which may partly be due to its higher price, partly to the difficulty of treating it.

Muschet recommended titanium in order to impart to steel greater hardness and other superior qualities, by adding titaniferous ores in the high furnace, cupola or during puddling. A very suitable iron is thus obtained.

Stoddard and Faraday fused steel with silver, platinum, osmium-iridium, rhodium, nickel, aluminium, as formerly Berthion did with chromium. Concerning rhodium steel, it is stated that it possesses extraordinary hardness. Platina steel is said to attain high polish, and nickel steel (meteor steel) is stated to attain the finest damascening. Those investigators ascribe the superior qualities of the Indian wootz steel to a small amount of aluminium, of which Karsten found only doubtful traces and Henry none at all. Gruner and Lan assert, on the contrary, that aluminium acts injuriously, and they call attention to the fact that for the Bessemer process those ores are most suitable which contain the least clay. Of silver only very small quantities pass into the steel (0.2 per cent., according to Faraday and Stoddard). By adding 1.500 silver to cast steel Finer could not discover any change or improvement, except that produced by remelting. All these often praised varieties of steel have as yet not attained the importance which was ascribed to them.

ADOLPH OTT.

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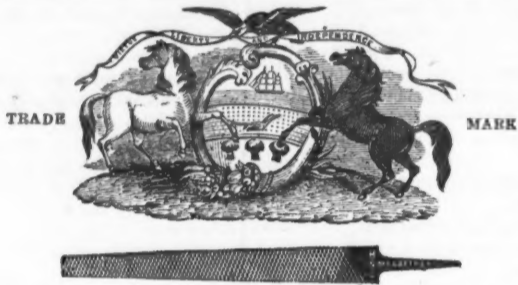
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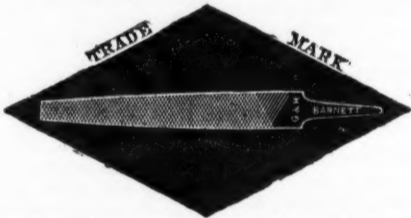
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166 Fulton Street, New York,

JAMES C. HAND & CO.,
COMMISSION MERCHANTS,

No. 614 & 616 Market Street,

PHILADELPHIA.

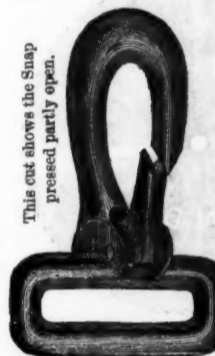
AGENTS FOR:

William Penn, Reading and Norristown Pig Iron.
Reading Iron Co.'s (Crescent Brand) Nails, Boiler Flues, &c.
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Heavy Hardware, &c., &c.

MIDDLETOWN TOOL CO.,
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The Celebrated "Baldwin" Plane Iron,
HENSHAW'S PATENT HARNESS SNAPS
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PAT. GAFF TOP-SAIL SELF-MOUSING SHIP HOOKS,

Plow, Filletster & Dado Stops of all kinds. Set Screws for
Plows, Bench Plane Starts, &c. Patent Washer Cutters. Plane
Iron Screws to order of any size.
Send for Illustrated Catalogue and Price List.



OTIS FURNACES & MINES.

New Union Steam Safety Elevator,

How One Works.

RIVERSIDE IRON WORKS, DEWEY, VANCE & CO.,
Wheeling, W. Va., January 14th, 1873.

Messrs. OTIS BROTHERS & CO., New York.
Dear Sirs: The experience of a year proves that your *Furnace Elevator* is superior to all others in use. We have in the six weeks from December 1st to Sunday last, 13th inst., made 9724 tons, 1401 lbs. Pig Metal, or an average of nearly 65 tons per day, which required the elevator to lift 72 feet high 4 1/2 tons Ore, Coke and Limestone for each ton of metal produced, or more than 11,500 tons material in the 6 weeks. The largest yield in one day was 81 1/4 tons Iron, involving the lifting of 345 tons material in 24 hours. This has all been done to our satisfaction, and that, too, in the coldest weather we have had. Other furnaces with water and pneumatic hoists have experienced great difficulty, on account of the water freezing in the tanks; and in the case of the air hoists, we understand that two furnaces, not far from us, had to "blow out," from being unable to hoist stock during the "cold snap." The difficulty, we are told, was caused by the condensed moisture in the blast freezing to the sides of the cylinders, so that the piston could not move up or down. Very truly, yours,
Dewey, Vance & Co.

Send for Circular to

OTIS BROTHERS & CO.,

348 Broadway, NEW YORK.

Biddle Manufacturing Co.,

FINE TOOLS

AND
Hardware Specialties.

We call the attention of Carriage Makers,
Machinists, Iron Rolling Manufactur-
ers, Blacksmiths, and
all others interested in Drill-
ing, Punching or Cutting
Iron, to our

Improved Drill Press,
Shear and Punch,

feeling assured that upon examina-
tion their merits must be apparent
to every one, from the fact that they
possess the essential characteristics
of strength, power and cheapness,
in a high degree.

Illustrated Catalogues and Price
Lists furnished on application.
We are also prepared to furnish
light work of any description and in any quantity to order.



All kinds of Die Forgings promptly attended to.

OFFICE & WAREHOUSES, 78 Chambers Street, New York.

CARTER & SON,
290 PRAIL ST., NEW YORK.

Moulders' and Plasterers' Tools.

Manufacturers of and Dealers in all descriptions of
Moulders' and Plasterers' Tools, and Dealers in
General Hardware, Gilded Copper Weather Vanes,
CARTERS' PATENT CARRIAGE LIFTING JACK, &c.

Grindstones, Emery, &c.

J. McDERMOTT & CO
GRINDSTONES.

Black River, Independence and Berea Grits.
BUILDING STONES
of every description, from the above quarries,
OFFICE, National Bank Buildings,
Cor. Superior and Water Sts. CLEVELAND,

WALTER R. WOOD & CO.,

Manufacturers of and Dealers in American
and ForeignGRINDSTONES
AND OHIO BUILDING STONE.

TRADE MARK. THE UNION STONE CO.
Patentees and Manufacturers of
Emery Wheels,
Oil Stones, and Emery
Blocks,

To order, in size and form to suit various mechanical
uses, Grinders, Saw, Gummers, Diamond
Tools, and Wood's Patent Knife Grinders for
Planing, Paper Cutting, Tobacco, Leather-Splitting and
other Long Knives. Also, Mill Stone Cement.
16 Exchange Street, BOSTON, MASS.
Branch Offices, 53 Liberty Street, NEW YORK
202 Commerce St., PHILADELPHIA.
Send for Circular.

THE TANITE CO.,
Inventors and Builders of special Machinery
Connected with Emery Grinding.

SOLID Emery Wheels

To avoid large file bills, to save the labor wasted on
slow cutting grindstones, to secure the best of Solid
Emery Wheels, buy Tanite Goods. A judicious use of
Tanite Emery Wheels and Grinding or Gumming
Machines will more than repay the cost in this year's work.
We have lately introduced half a dozen new styles of Ma-
chines for Emery Grinding. Prices: \$15, \$20, \$25, \$30, \$35,
\$40, \$45, \$50, \$55, \$60, \$65, \$70, \$75, \$80, \$85, \$90, \$95, \$100. Send for Circulars and
Photographs to

The Tanite Co.,
Stroudsburg, Monroe Co., Pa.
N. B.—Stone Manufacturers are specially invited
to request information.

HOWSON'S

OFFICES FOR PROCURING
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PATENTS,
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Communications should be addressed to the
PRINCIPAL OFFICES PHILADELPHIA.

JAMES A. WHITNEY, Patent Agent
and Expert, offers his service to inventors in
securing American and Foreign Patents, as ex-
pert in patent cases, &c.
"We take pleasure in commending the new agency
to the favor of inventors." *The Iron Age*, June 6.
"A thorough mechanical engineer with a valuable
practical experience in the machine shop." *Am. Rail-
way Times*, Boston, June 6.
"His long experience in this field of investigation
has made him familiar with the business in all its
branches, and we can confidently recommend him to
those needing his services." *Pacific Farmer*, Chicago,
June 6.
"Few persons have had more opportunities for
learning the necessities of such a business." *The World*
(weekly), New York City, June 19.
"A thorough mechanical engineer with a valuable
practical experience in the machine shop." *Am. Rail-
way Times*, Boston, June 6.
"His long experience in this field of investigation
has made him familiar with the business in all its
branches, and we can confidently recommend him to
those needing his services." *Pacific Farmer*, Chicago,
June 6.
Address, for full information, free of charge,
125 Broadway, Room 11, New York City.

BUSINESS ITEMS.

NEW YORK.

The Rome Iron Works, of which Mr. Edward Huntington is president, are very large manu-
facturers of railroad iron, employing 300 men,
and will turn out 20,000 tons of iron the present
year. They have seven double puddling fur-
naces, eight heating furnaces, two cranes, etc.
They occupy one building 150x223 feet, another
120x160 feet, and several smaller buildings in
connection with the works. The works are
run by two engines, one of 500 horse-power, for
rails, built by the Yale Iron Works, of Con-
necticut, and a smaller one of eighty horse for
other purposes. T. G. Nock is superintendent.

S. Adams & Son, at Rome, manufacture Har-
ris' turbine water wheel, mill gear, shafting,
and pulleys. They have one stone shop, 59x
190 feet, 3 stories; a foundry, 60x80 feet, of
stone, one story, and several smaller buildings.
They employ 45 men.

PENNSYLVANIA.

The work of grading for the new Edgar
Thompson Steel Works, at Pittsburgh, is being
pushed forward vigorously. A large force of
laborers are employed, and a considerable
amount of work has already been accomplished.

Mr. George Westinghouse, Jr., of Pittsburgh,
inventor of the Westinghouse air brake, has just
received a patent on an improved brake cou-
pling, which is thus described: Each half of the
coupling has a nozzle and socket at its inner
end on and in a corresponding socket and noz-
zle of the next coupling, so that the half-
coupling on either end of either car will couple
on to any other half-coupling on the train.
Spring hooks and hand levers are used on the
coupling to hold the two halves together, and
are duplicated in each half and arranged oppo-
site to each other in each half of the coupling.

Clark, Reeves & Co., of Phoenixville, have
received an order from the Chicago and Alton
Railroad for seven spans of bridges, of 160 feet
each. This firm are also at work on the Girard
avenue bridge, Philadelphia, which will be an
elegant structure.

Billmyer & Smalls, car builders, York, have
enlarged their works, and added machinery for
the construction of every kind of cars.

The National Iron Company, at Danville, has
been declared bankrupt.

MASSACHUSETTS.

Mr. R. T. Buck, of the firm of Buck Brothers,
the well-known chisel manufacturers, of Mill-
bury, sailed for Europe on the 13th inst. Mr.
Buck will visit his native city of Sheffield after
an absence of 20 years.

The Smith's Iron Foundry, Salem, was es-
tablished in 1845. In addition to other work,
they manufacture the widely-known "Smith's
Furnace Grate Bars," which, it is said, are so
constructed that they cannot possible warp.
Albert Alden, of Middleborough, intends
building a brass foundry near the Bay State
Straw Works.

CONNECTICUT.

The Schneller & Hotchkiss Company, of An-
sonia, have sold out to the American Steel and
Variety Company, a new company with \$50,000
capital. Mr. Schneller is to be the general
manager, and J. C. Hotchkiss, secretary.

Landers, Frary & Clark, of New Britain,
have for the fourth successive year received the
award of the Indian department for the usual
large quantity of butcher knives.

A box of plows has recently been shipped to
Port Natal, South Africa, by the Higgannum
Manufacturing Company, for the use of the
natives of the Zulu Mission, situated thirty or
forty miles from Port Natal. Another box of
plantation hoes has also been shipped by Scovill
Brothers to the same place. The plows and
hoes manufactured by these companies are con-
sidered preferable to those from England.

The Ansonia Brass and Copper Company are
making ready to put up a new three-story build-
ing to accommodate their increased business
in clocks.

A wheel for the utilization of tide power is to
be put in the Quinnipiac River by the inventor,
Mr. Bushnell, of New Haven. It is expected
to produce 7000 horse power.

NEW HAMPSHIRE.

The Ranlet Manufacturing Company, of
Laconia, are building one hundred dump-cars
for the Old Colony Railroad.

The Sturtevant Manufacturing Company, at
Lebanon, has been recently organized and is
now in good working condition. They employ
four hundred hands. Jesse C. Sturtevant is
president, W. S. Moses, treasurer, and P. E.
Davis, clerk.

The Ranlet Car Company, at Laconia, has
been building some very handsome cars for the
new Nashua, Acton and Boston Railroad, and
are building two excursion cars for the same
road.

Frank R. Woodward's Excelsior Needle
Works have been purchased by S. Woodward
& Co.

MAINE.

At Harrison, is located the Tolmans & Co's
wire factory and mills, who are doing a very
extensive business in the manufacture of card
wire.

A brass foundry is about to be built by the Bel-
fast Foundry Company, at Belfast, to be used
in connection with their works at that place.
It will be furnished with galvanizing machinery.
They are now making models for new patterns
of ship pumps and capstans.

Warren & Pennell's Wire Factory, at Sacara-
pa, manufacture all sorts and sizes of wire, the
finest being sold to go to Massachusetts where
it is woven into wire netting.

D. Knowlton & Co., of Camden, have con-
tracted to furnish 100 sets of car wheels and
axles of the "continental gauge" for the East-
ern and North American Railway, for use when
the track has been narrowed. The same firm
will also build a large number of box cars for
this road.

The Camden Anchor Factory turn out about

700 tons of anchors yearly. Lately the company
has shipped a large number to the lakes.

MARYLAND.

The Baltimore Car Wheel Company is turning
out sixty-eight car wheels per day of the very
best quality, manufactured under the patent of
Mr. Wm. J. Cochran.

VIRGINIA.

The Staunton *Vindicator* says: The vein of
iron opened at Fishersville, by Benjamin F.
Jordan, is proving one of the most valuable
that has been opened in this country. The
opening is 100 feet long, and the vein is 30 feet
wide. The ore is hematite and yields fifty per
cent. iron, and a ton of metal can be made with
one and a quarter tons of coal. There is no sil-
ica or sulphur in it.

A company, composed of Vermont gentle-
men, have bought the blast furnace at Muddy
Creek, and are now engaged in putting in
the machinery, &c., and increasing the capacity
of the works to manufacture pig metal.

GEORGIA.

The city council of Atlanta has passed an or-
dinance exempting cotton, wooden and iron fac-
tories from taxation for the next 15 years.

ALABAMA.

The Woodstock Iron Works, in Calhoun
county, the property of the Noble Brothers, of
Rome, have been put in operation, and turned
out 18 tons of the best grade of pig iron in 36
hours. Their capacity is twenty-five tons per
day, and this amount will soon be turned out.

The Northern and Southern Railroad of
Georgia, in passing through Alabama, cuts
through vast deposits of iron ore and coal,
which are also parallel to the Alabama and
Chattanooga Railroad. One of these is a vast
mountain of the red fossiliferous iron ore, over
100 miles in length, in which the iron vein is
for 35 miles over 30 feet in thickness. This is
called the Red Mountain, and from it is named
the Red Mountain Iron Company, who propose
to use the ore. The furnaces, two in number,
were built during the war, but only one of them
used for a short time. During an army raid
they were dismantled, but have been lately re-
paired by a new company, which owns 7000
acres of land, from which to draw stone, coal,
ore, or charcoal. The furnaces have a joint ca-
pacity of 30 tons per day.

The Tecumseh Iron Company, of Cherokee
county, was recently organized under favorable
circumstances. It has a subscribed capital of
\$100,000, with many leading citizens of Alabama
and Georgia as stockholders.

UTAH.

An incorporation with a capital stock of
\$1,000,000 has been formed in Salt Lake City,
for the purpose of reducing Utah ores with the
oxy-hydrogen furnace invented by Levi Stevens.

ILLINOIS.

The Western Screw and Manufacturing Com-
pany, a new St. Louis enterprise, has just begun
operations in Alton. The present force of fifty
hands will be increased from time to time as
the enterprise develops. The company have
orders in advance to the amount of \$40,000.

INDIANA.

The Sheffield File Works have been establish-
ed in Indianapolis, by King & Howson. They
make a good quality of extra cast steel files, and
recut old ones.

If sufficient inducements are offered, the pro-
prietors of the Grain Drill Manufactory, at Dub-
lin, now employing seventy-five men, will locate
in Indianapolis.

MICHIGAN.

The Rolling Mill at Jackson, which has been
lying idle for a short time past, is now in par-
tial operation. The mill has been started on a
scale that will allow the manufacture of ten
tons of iron per day—this with four puddling
furnaces at six heats per day. After business
is fairly under way the remaining four furnaces
will be kindled, which will increase the product
of the mill to twenty-two tons per day. They
employ at present but thirty men, but contem-
plate erecting several additional furnaces as soon
as their business will admit of it, as their rolling
machinery has a capacity of thirty-five tons per
day. The mill contains two sets of rolls, a six-
teen inch train and a twelve inch train. The
power is derived from an engine of 200 horse-
power, with a twenty foot fly wheel, capable of
ninety revolutions per minute.

MINNESOTA.

The St. Paul Harvester Works are owned by
a company organized last fall for the manufac-
ture of the Elward harvester, with a capital
stock of \$250,000. The buildings comprise a
foundry and blacksmith shop 36x80 feet; ma-
chine shop, 32x75 feet; drying house, 30x40
feet; a temporary bender's shop, wood shop,
36x120 feet; and paint shop, 33x120 feet, all ar-
ranged with a view to future extension. The
works employ at present 100 hands, and have a
capacity of 3000 finished harvesters a year. This
year all the machines they can possibly deliver
will be sold for cash or short time.

MISSOURI.

A new car manufacturing company, with a
capital of \$20,000, was organized at Hannibal,
recently. The name of the company is the Han-
nibal Car Works.

The Louisiana Bridge Company, with a capital
of \$500,000, has been organized to build a bridge
over the Mississippi at Louisiana.

The Oange Iron Works, in Camden county,
have commenced operations.

OHIO.

The Ironton Mill will be turned over to the
Ironton Steel and Iron Co. shortly after the elec-
tion of the directors for that company. Plans
will be at once perfected for the erection of a
furnace of, probably, not less than fifty tons ca-
pacity, which is expected to be in blast in No-
vember next.

The Lake Erie Iron Company, Cleveland, em-
ploy 175 hands in the manufacture of merchant
bar iron, forged axles, and forgings of every
description. Their product comprises 4000 tons
refined bar iron, and 4000 tons of railway axles
and forgings.

HENRY DISSTON & SONS'

SAW, TOOL,

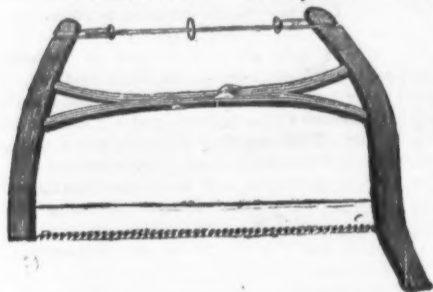
STEEL AND FILE WORKS,

Front and Laurel Streets,

PHILADELPHIA, PA.

Hankins' Elliptic Forked Saw Frame.

Patented June 28th, 1870.



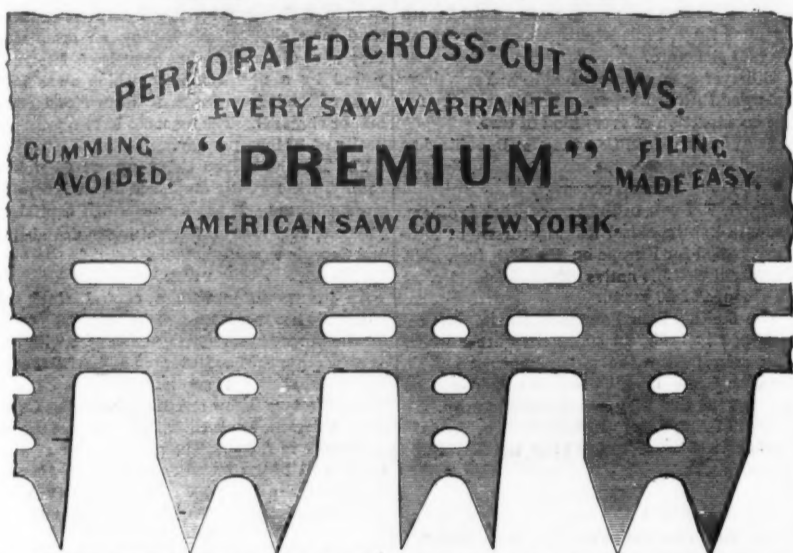
The annexed engraving represents HANKINS' ELLIPTIC FORKED SAW FRAME, which commends itself to the trade for its simplicity of construction. The Forked Frame being all in one piece, without any centre bolt, secures for the Frame great strength and durability.

These Frames are put up with my best Webs, marked "No. 40, Harvey W. Peace."

HARVEY W. PEACE
VULCAN SAW WORKS,
WILLIAMSBURG, N. Y.

AMERICAN SAW CO.,

No. 1 FERRY STREET, NEW YORK.



Solid saws require frequent gumming, thereby subjecting them to risk of springing or breaking. This is especially the case with cross cuts having Patent Teeth. In the perforated saws all gumming is avoided, and the teeth are easily kept long and in proper shape, saving files, labor, expense and vexation. As is well known, our saws cut faster, smoother and easier than any other.

MOVABLE-TOOTHED CIRCULAR SAWS AND SOLID SAWS OF ALL KINDS.

J. FLINT & CO.

Manufacturers of all kinds of **SAWS and PLASTERING TROWELS.**
ROCHESTER, N. Y.

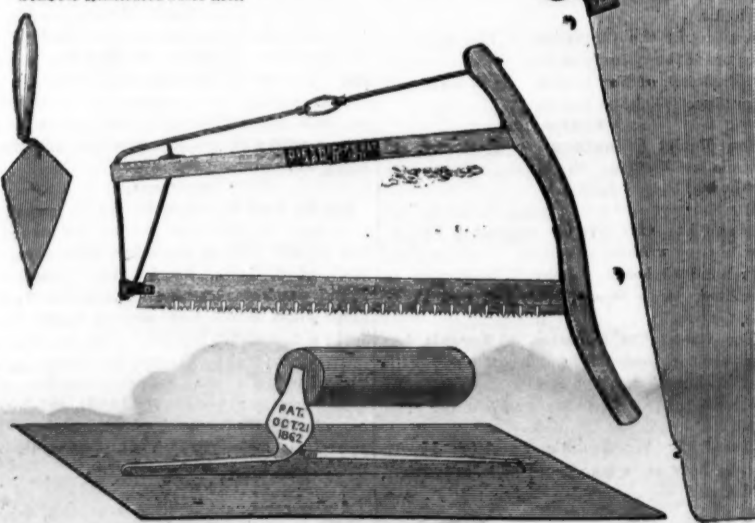
Dietrich's Patent Wood Saw. Guaranteed the strongest, lightest, easiest to strain or tighten and best braced wood saw made; also to give perfect satisfaction.

Dietrich's Patent Double Handle Rip Saw. All will readily see the benefit of this useful invention.

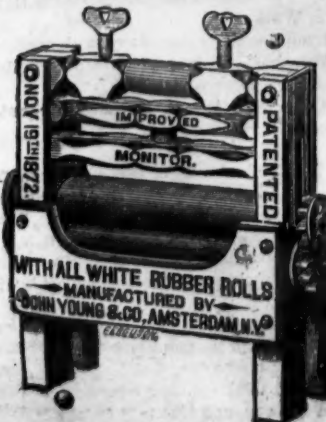
J. Flint's Patent Plastering Trowels. The best made and finished Trowels in the world. We make four grades of Plastering Trowels, from the best to the cheapest.

Our patent method of grinding hand saws makes them superior to any in the market.

Send for Illustrated Price List.



Improved Monitor Wringer.



With Cog Wheels at both ends of the rollers. Sold by Hardware and Woodenware Dealers everywhere.

We use the Patent Moulton Rubber Roller, which is warranted not to turn on the Shaft.

Manufactured by

John Young & Sons,
RUSSELL & ERWIN MFG. CO.,
45 & 47 Chambers St., General Agents, N. Y.
210 & 18 North 5th St., Philadelphia, Pa.



H. W. PEACE,

MANUFACTURER OF

SAWS OF ALL KINDS

FACTORY, WILLIAMSBURG, N. Y.

LIVINGSTON'S

PATENT BRACED

WOOD SAWS,

Pat. BUTCHER & KITCHEN SAWS

Recognized Standard Goods for durability, quality and finish.

For sale by the Hardware Trade and

T. F. Cheritree & Co., New York.

Excelsior Saw Works.

515 Cherry St., Philadelphia.

WM. McNIECE,

Manufacturer of

Superior Cast Steel Hand, Panel,

Ripping, Ice, Compass, Hack,

Butchers' Bow, Grafting, Pruning,

Keyhole and Web Saws,

Mowing Knives, Trunk Springs,

And all other kinds of Springs, made

from Sheet Cast Steel.



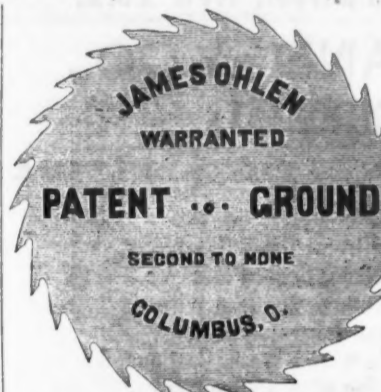
Capron's Improved Turbine

WATERWHEEL.

POLISHED & DETACHABLE BUCKETS

CHEAPEST & BEST WHEEL MADE.

CAPRON WATERWHEEL CO. HUDSON N.Y.



I make a specialty of the LARGEST SIZES of Circular Saws, and call particular attention of lumber manufacturers to the following points of excellence: Evenness of Temper.—The peculiar structure of my furnace subjects all parts of the saw to a DEAD heat, and when dipped in the oil bath secures perfect uniformity.

Perfect Accuracy in Thickness.—My saws are ground on a patent machine, automatic in its operation, grinding off the thick places upon the plate before the thinner parts are reached, and when the saw is removed BALANCES PERFECTLY, which is proof positive of the right accomplishment of the work.

Properly Hammered.—Great care is taken that no saw shall leave my works without due attention in this important particular. A saw too tightly strained upon the rim, or too loose in the center, cannot be successfully run—hence the importance of so hammering the saw as to effect equal strain in all its parts, and at the same time RUN TRUE. This department is under the personal supervision of myself, who has devoted over twenty years to the art of saw making.

I am sole proprietor and manufacturer of the celebrated "Challenge" Cross-Cut Saw. Price Lists of all kinds of saws sent on application.

JAMES OHLEN.

WORRALL & CO.,

MANUFACTURERS OF

EXTRA CAST STEEL SAWS,

Plastering Trowels, Tools, &c.

Saw Manufactory, Iron Foundry & Machine Shops, ELIZABETHPORT, N. J.

Office and Warerooms, 28 Elm Street, New York.

CHALLENGE
DOOR & GATE SPRING.



PATENTED
JULY 11th 1871.

CHALLENGE
DOOR & GATE SPRING.



PATENTED
JULY 11th 1871.

BROWN, HARRIS & HOPKINS,

Hardware Merchants,

and Manufacturers of the

CHALLENGE
DOOR & GATE SPRING.



PATENTED
JULY 11th 1871.

CHALLENGE
DOOR & GATE SPRING.



PATENTED
JULY 11th 1871.

The Challenge Springs are manufactured from Steel Wire, tempered by an Improved Process, the result of repeated experiments, and must not be classed by dealers with the numerous worthless "Coil Springs" made from common Red Spring Wire.

Nos. 180 Greenwich and 58 & 60 Dey Sts., NEW YORK.



BOYNTON'S LIGHTNING SAWS.

Awarded the Medal of the American Institute, 1878.



A Challenge of \$500, toward expense of a public test, to prove that the Lightning Saws excel all others in Speed, Ease, and Simplicity, has been offered since 1870, and has never been accepted. More than 100,000 Lightning Saws were sold during the year 1878, the purchasers of which testify to their superior merits.

Our leading papers, such as the Tribune, American Agriculturist, Christian Union, etc., have published over sixty editorial notices recommending these Saws. Farmer's Clubs, Lumbermen, and Hardware Dealers unite in pronouncing the genuine Lightning Saw the greatest labor-saving implement of the age.

I have hundreds of letters from practical sawyers, voluntarily written, expressing their entire approval of these Saws.

Where the Hardware Trade do not sell the Lightning Saw, I will send a 6-foot cross-cut and a buck saw-blade on receipt of \$5.

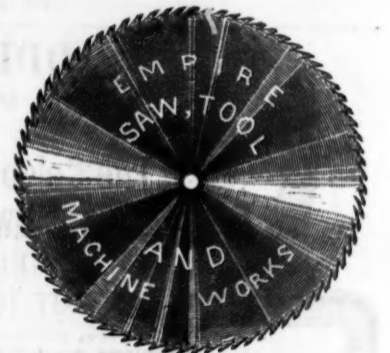
For Catalogue and additional information, address

E. M. BOYNTON, 80 Beekman St., New York,

Sole Proprietor and Manufacturer.

JAMES ECCLES, ENGINEER

and General Machine Maker,
2423, 2425, 2427 Lombard St., Philadelphia, Pa.



SAWS OF ALL KINDS.

Saw Grinding Machinery

Of the most approved make, on hand and for sale; warranted to grind either straight or to any given taper or bevel. Sole maker of the

Quadruple Screw Power Press.

General Machine Work executed to order.

WHEELER, MADDEN

&

CLEMSON,

Manufacturers of Warranted Cast Steel

SAWS

of every description, including

Circular, Shingle, Cross Cut,

Mill, Hand, Roberts' and

other Wood Saws,

&c., &c

Cast Steel Files

of the well known brand of

Wheeler, Madden & Clemson.

FACTORIES:

Middletown, Orange Co., N. Y.

BRANCH OFFICE:

97 Chambers Street, New York.

BRUNDAGE FORGED HORSE NAILS,

Manufactured from

BEST NORWAY IRON,

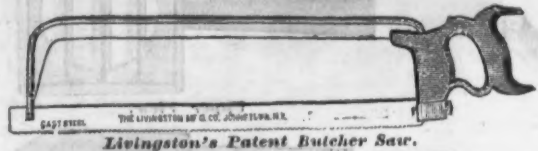
by **BRUNDAGE & CO.** Sold by

WHEELER, MADDEN & CLEMSON.

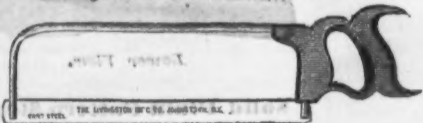
Middletown, Orange Co., N. Y.

T. F. CHERITREE & CO., HARDWARE,

95 Reade and 113 Chambers Street, New York.



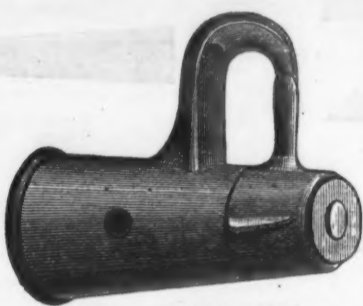
Livingston's Patent Butcher Saw.



Livingston's Patent Kitchen Saw.



May Fork Pulley.



Patent Whiffletree Hook.



Livingston's Patent Braced Wood Saw.

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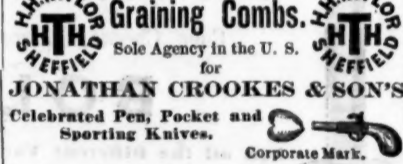
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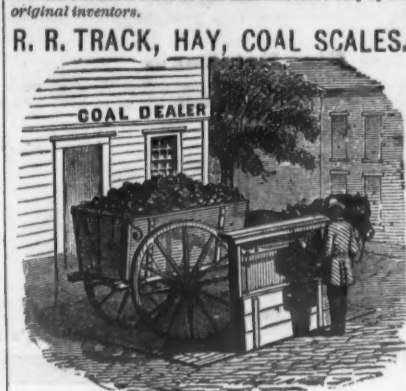


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The Manufacture of Rails in the United States.

The total number of net tons of rails made in the United States in 1872, as reported to the office of the American Iron and Steel Association by the makers, is 941,992, or 841,064 gross tons. This aggregate was produced in the following States, the production of each of which in 1872 is given in comparison with the production in 1871:

STATES.	1872.	1871.
Pennsylvania.....	419,529	85,604
Ohio.....	131,928	75,782
Illinois.....	166,916	91,178
New York.....	82,487	87,028
Wisconsin.....	37,394	32,774
Massachusetts.....	99,349	28,164
Maryland.....	36,472	44,911
Indiana.....	23,868	12,778
West Virginia.....	20,100	5,000
Missouri.....	15,340	8,330
Tennessee.....	14,520	9,667
Maine.....	14,064	13,383
Michigan.....	9,883	14,000
New Jersey.....	9,186	6,700
Georgia.....	6,990	7,840
Kentucky.....	4,000	6,000
Total.....	941,992	775,733

This aggregate of production includes only such rails as were made for the use of freight and passenger railways, and excludes 15,000 tons of street rails and all mining rails made during the year. More mining rails are made by bar mills than by rail mills, and they are generally classified as bar iron; hence the impossibility of ascertaining exactly the production of this class of rails in any year. Were the fact otherwise, however, we but follow the precedent of this office in excluding from our statistics of rails any estimate of the production of mining rails, as well as the ascertained production of street rails.

By this table it will be observed that in 1872 Pennsylvania made 419,529 tons, or 44 1/2 per cent. of the whole. Ohio comes second in the list, taking the place which Illinois held in 1871. Illinois is the third State in the list, and New York the fourth. In the production of steel rails the relative position of these four great iron-producing States is almost the same—Pennsylvania producing 38,463 tons, Ohio 22,000 tons, Illinois 15,930 tons, and New York 17,077 tons. No other States made Bessemer rails in 1872. The largest production of both iron and steel rails by a single mill must be credited to the Cambria Iron Works, at Johnstown, Pa., which made a total of 81,006 net tons. This magnificent result was accomplished during a year in which a large part of the works was destroyed by fire—a calamity which it is proper to state, however, was almost immediately overcome by the extraordinary energy and resources of the company.

The following table exhibits the growth of the home production, importation, and consumption of rails in the United States from 1849 to 1872, inclusive, together with the growth of the railway system of the country during the same period:

Years.	Total Rails made in U. S. of 240 lb. weight.	Total Rails imported, of 240 lb. weight.	Total Consumption of Iron and Steel Rails.	Miles of Rail Road built in each year.
1849.....	24,318	69,163	93,481	1,269
1850.....	44,083	159,180	203,163	1,656
1851.....	60,003	246,350	306,353	1,961
1852.....	62,479	394,750	457,229	1,926
1853.....	87,894	338,734	426,628	2,432
1854.....	108,016	339,439	447,455	1,360
1855.....	138,674	153,019	291,693	1,554
1856.....	180,018	186,394	366,412	3,643
1857.....	161,918	315,166	377,084	2,492
1858.....	163,712	96,294	260,006	2,460
1859.....	196,454	83,058	279,512	1,821
1860.....	205,038	146,610	351,648	1,845
1861.....	187,818	89,384	277,202	621
1862.....	213,912	10,136	224,048	864
1863.....	276,708	30,546	307,254	1,450
1864.....	325,369	112,457	437,826	788
1865.....	356,392	63,327	419,719	1,277
1866.....	430,778	117,878	548,656	1,839
1867.....	462,108	134,584	596,692	2,287
1868.....	506,714	300,160	806,874	4,100
1869.....	593,586	336,500	930,086	6,977
1870.....	630,000	472,403	1,102,403	4,145
1871.....	715,733	566,222	1,281,955	7,453
1872.....	941,992	59,860	1,001,852	6,043

The production of rails in 1871 in the United States was 775,733 net tons; in 1872 it was 941,992 tons. Increase, 166,259 tons, or 21 1/2 per cent. The importation of foreign rails in 1871 was 506,202 net tons; in 1872 it was 59,860 tons. Decrease, 35,352 tons, or 6 1/2 per cent. The net gain of the American railmaker in 1872 over his foreign rival was therefore 201,611 net tons.

Of the total production of 941,992 net tons of rails in 1872, 94,070 tons were Bessemer steel rails. In 1871 there were produced 60,042 net tons of steel and steel-headed rails. Increase, 34,028 tons, or 56 1/2 per cent. Of the 530,850 net tons of rails imported in 1872, 149,790 tons were steel rails. In 1871 it is estimated that there were imported 83,887 net tons of steel rails. Increase 65,899 tons, or 78 1/2 per cent.

It will be seen that, while the importation of rails of all kinds was 35,352 net tons less in 1872 than in 1871, the importation of steel rails increased 65,899 tons. The reduction in the importation of all iron rails was, therefore, 101,941 tons.

The total consumption of iron and steel rails in 1871 was 1,281,955 net tons; in 1872 it was 1,001,852 tons. Increase, 130,907 tons. This increased consumption was more than equalled by the increased production of American mills, which was 166,259 tons, as above stated.

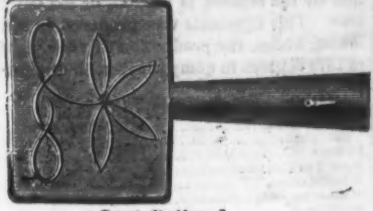
The importation in 1872 of old rails for re-manufacture is carefully estimated at 170,000 gross tons. The customs regulations do not separate old rails from scrap iron; hence the necessity of estimating the quantity of each imported. The total importation of old and scrap iron in 1872 was 248,444 gross tons, valued at \$7,617,463, gold, of which Great Britain sent 108,181 tons, valued at \$3,302,746. In 1871 Great Britain sent us 139,512 tons, valued at \$3,255,849.

During the year ended December 31, 1872, the aggregate value of the imports of iron and steel manufactures thereof, as officially reported to this office by Hon. Edward Young, Chief of the Bureau of Statistics, Treasury Department, was \$60,575,514, gold, of which \$22,705,025 represents the value of new iron and steel railroad bars—\$14,406,012 of iron, and \$8,307,013 of steel. During the 10 months ended October 31, 1871, the export from the United States of American railroad bars and rails was 320 net tons; during the same period of 1872 the export was 740 tons. Increase, 150 per cent. These figures of our export trade are comparatively unimportant, but they show progress in the right direction.—Bulletin American Iron and Steel Association.

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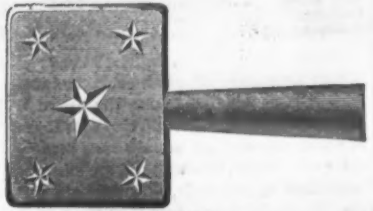
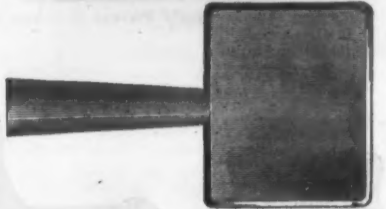


Upper View.



Lower View.

Solid Plain Pattern Steps.



Star Pattern.

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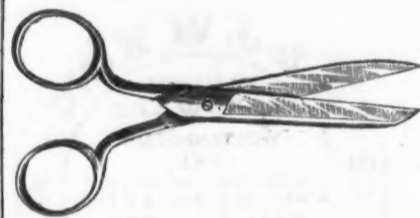
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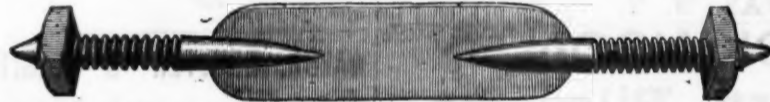
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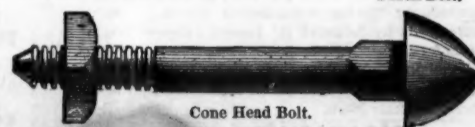
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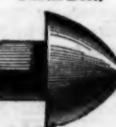


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Little Chas. E., 59 Fulton, N. Y.	13
Cordage, Rope, etc.	
Allen D. S. & Co., 120 Front, N. Y.	32
Corrugated Stove Pipe Kibows, Makers of.	
Corrugated Metal Co., East Berlin, Conn.	4
Bellows Kibow Co., N. Y. and Chicago.	24
Crucibles, Manufacturers of.	
Newkum & Co., 127 N. Front, Phila.	15
Joseph Dixon Crucible Co., Jersey City, N. J.	15
Ross, Stow & Hofferkamp, 1330 N. 9th, Phila.	15
Taylor, Stow & Co., Phila.	15
Curry Combs, Manufacturers of.	
Kellogg W. F. & Co., Troy, N. Y.	20
Cutlery, Importers of.	
Bonstedt-Kind (Solingen), 271 Canal, N. Y.	11
Dickinson Henry, 40 and 42 Beade, N. Y.	11
Fisher Jos. S., 311 Chambers, N. Y.	11
King H. & J. W., 50 Chambers, N. Y.	11
Peace Chas. Jr., 52 Chambers, N. Y.	11
Ward Ashline, 101 Duane, N. Y.	11
Wilson Hawksworth, 111 Duane, N. Y.	11
Smith & Hall, 92 and 94 Beade, N. Y.	11
Taylor Thomas, 43 Chambers, N. Y.	11
Cutlery, Manufacturers of.	
American Knife Co., Thomaston, Conn.	11
Burkhardt Aaron, Pepperell, Mass.	11
Landers, Fray & Clark, 238 Broadway, N. Y.	11
Miller Bros. Cutlery Co., W. Meriden, Conn.	11
New York Cutlery Co., 111 Duane, N. Y.	11
U. S. Steel Shear Co., W. Meriden, Conn.	11
Differential Pulley Blocks, Makers of.	
Van Wart & McCoy, 45 Chambers, N. Y.	31
Dredging, and Makers of Dredging Machines.	
Am. Dredging Co., 114 S. Delaware, N. Y.	30
Drill Chucks, Manufacturers of.	
Cushman A. F., Hartford, Conn.	30
Hubbard & Curtis Mfg. Co., 28 Chambers, N. Y.	31
Drill (Hand), Manufacturers of.	
Morrill & Tibbott, Williamsburg, N. Y.	21
Drilling Machines, Makers of.	
Miller Falls Co., 78 Beekman, N. Y.	21
Thorne & De Haven, Philadelphia.	21
Edge Tools, Makers of.	
Bradley G. W., 87 Chambers, N. Y.	8
Elevators, Makers of.	
Otis Bros. & Co., 818 Broadway, N. Y.	9
Emery Wheels, Makers of.	
The Tenth Co. of Hardsburg, Pa.	9
The Union Stone Co., 15 Exchange, Boston.	9
Merrill E. C., W. Charleston, Vt.	9
Enamelled and Plain Hollow Ware, Mfgs. of.	
Foxall & Jones, Troy, N. Y.	23
Engineers, Machinists, etc.	
Henshall James, 1056 Beach, Phila.	31
James Moore, cor. 15th and Buttonwood, Phila.	31
Tava & Hartman, 123 N. Front, Phila.	31
Engines, Steam, Makers of.	
Flahill Landing Mch. Co., Flahill-on-the-Hudson, N. Y.	30
N. Y. Steam Engine Co., 11 Chambers, N. Y.	30
Ulrich Steam Engine Co., Ulrich, N. Y.	30
Whitcomb, Smith & Co., Newburgh, N. Y.	24
Wright J. W., 112 Spruce, Phila.	24
Engravers, Wood.	
Patterson Jas. S., 21 Spruce, N. Y.	20
Roberts Wm. B., 123 and 124 N. 4th, Phila.	21
Tuttle, D. H. & Co., 123 N. 4th, Phila.	21
White H. R., 60 John, N. Y.	24
Faucets, Self-Measuring, Makers of.	
Enterprise Mfg. Co., 174 Phila. and N. Y.	26
Files, Importers of.	
Carr J. & Riley, 82 John, N. Y.	28
Dickinson Henry, 60 and 61 Beade, N. Y.	28
Fisher Joseph S., 11 Chambers, N. Y.	28
Fraser Peter A. & Co., 50 Fulton, N. Y.	28
Homer Foot & Co., Springfield, Mass.	28
Moss F. W., 50 John, N. Y.	28
Sanderson Bros. & Co., 16 Cliff, N. Y.	28
Spears & Jackson, 96 Chambers, N. Y.	28
Files, Manufacturers of.	
Barnett G. & Co., 41 and 43 Richmond, Phila.	6
McCaffrey & Bro., 132 and 134 N. 4th, Phila.	6
Nicholson File Co., Providence, R. I.	6
Robinson M. W., 79 Chambers, N. Y.	6
Wholesaler, Clemson & Co., Middletown, N. Y.	6
Fire Arms, Manufacturers of.	
Remington E. & Sons, Ilion, N. Y.	7
Hall A. & Sons, 100 Amboy, N. J.	7
Robinson M. W., 79 Chambers, N. Y.	7
Schroeder & Daly, 84 Chambers, N. Y.	7
Fire Brick, Makers of.	
Bowman O. O. & Co., Trenton, N. J.	15
Hall A. & Sons, 100 Amboy, N. J.	15
Kellogg B. C. & Co., Hartford, Conn.	15
Newkumet Phila., 2nd and Vine, Phila.	15
Palmer, Newton & Co., Albany, N. Y.	15
Paton John B., Perth Amboy, N. J.	15

Fluting Machines, Makers of.	25
Lowrey & Tucker, Newark, N. J.	25
Gage Cocks and Damper Regulators.	
Murphy & Keltner, Baltimore, Md.	21
Galvanized Iron.	
Lefferts Marshall Jr., 41 Beekman, N. Y.	4
Galvanized Wire.	
Field Alfred & Co., 41 John, N. Y.	3
Gate Hinges, Self-Closing, Makers of.	
Clark & Co., Buffalo, N. Y.	23
Glass, Importers of.	
Downing A. C. & Co., 87 Beekman, N. Y.	13
Hills, Turner & Harmon, 123 State, Boston.	13
Glue Pots, Family, Makers of.	
J. & E. Stevens Co., Cromwell, Conn.	26
Governors, Makers of.	
Gracie D., Philadelphia, Pa.	31
Grindstones.	
McDermott J. & Co., Cleveland, O.	9
Wood Walter R. & Co., 233 and 235 Front, N. Y.	9
Gunpowder, Makers of.	
Knapp & Co., 100 Chambers, N. Y.	28
Lafin & Hand Powder Co., 51 Park Row, N. Y.	28
Hammers, etc., Manufacturers of.	
Emmet Hammer Co., Brooklyn, E. D., N. Y.	20
Mint & Co., Oliver, Boston.	20
Hammers, etc., Manufacturers of.	
Tiebout W. & Co., 200 Pearl, N. Y.	2
Hardware, Commission Merchants.	
Fernald & Sme, 100 Chambers, N. Y.	8
Green H. M., 100 Chambers, N. Y.	8
Graham & Haines, 8 Chambers, N. Y.	8
Walbridge Geo. B., 55 Chambers, N. Y.	8
Hardware Dealers.	
Brown, Harris & Hopkins, 120 Greenwich, N. Y.	10
Finney Thos. L. & Co., 100 Chambers, N. Y.	10
Hubbard & Curtis Mfg. Co., 28 Chambers, N. Y.	10
Lloyd, Supple & Walton, 63 Market, Phila.	6
Louderback, Gilbert & Co., 53 Chambers, N. Y.	6
Shepard Sidney & Co., Buffalo, N. Y.	6
Turner, Seymour & Judd, 61 Duane, N. Y.	6
Walsh, Conliffe & Flagler, 53 Chambers, N. Y.	6
Hardware Importers.	
Beam & Murray, 54 Cliff, N. Y.	22
Baker Hermann & Co., 101 Duane, N. Y.	22
Field Alfred & Co., 41 John, N. Y.	22
Hilger & Sons, 87 Chambers, N. Y.	22
King H. & J. W., 50 Chambers, N. Y.	22
Louderback, Gilbert & Co., 53 Chambers, N. Y.	22
Louderback, Gilbert & Co., 53 Chambers, N. Y.	22
Van Wart & McCoy, 45 Chambers, N. Y.	21
Turner R. A., 87 Chambers, N. Y.	21
Whebusch F., 84 Chambers, N. Y.	22
Hardware Manufacturers.	
Biddle Mfg. Co., 78 Chambers, N. Y.	22
Chertree T. F. & Co., 113 Chambers, N. Y.	22
Corbin F. & Co., 100 Chambers, N. Y.	22
Enterprise Mfg. Co., Phila.	22
Hart, Bliven & Mead Mfg. Co., 243 Pearl, N. Y.	22
Hubbard & Curtis Mfg. Co., 28 Chambers, N. Y.	22
Kellogg Wm. F. & Co., Troy, N. Y.	20
Lane, Gate & Co., Troy, N. Y.	20
Louderback, Gilbert & Co., 53 Chambers, N. Y.	22
Many F. L. & Marshall, 48 Warren, N. Y.	20
Middleton Tool Co., 82 Chambers, N. Y.	20
Miller's Falls Mfg. Co., 78 Beekman, N. Y.	22
Pratt & Co., Buffalo, N. Y.	22
Providence Tool Co., 11 Warren, N. Y.	22
Russell & Ervin Mfg. Co., 45 Chambers, N. Y.	22
Schwartz Mfg. Co., 57 Beade, N. Y.	22
Shattuck W. F. & Co., 113 Chambers, N. Y.	22
Stanley Works, 58 Beekman, N. Y.	22
Taylor Mfg. Co., 100 Chambers, N. Y.	22
Union Mfg. Co., 55 Chambers, N. Y.	22
Williams, White & Co., 113 Warren, N. Y.	22
Wilson Mfg. Co., 57 Chambers, N. Y.	21
Hardware Specialties.	
Biddle Mfg. Co., 78 Chambers, N. Y.	22
Louderback, Gilbert & Co., 53 Chambers, N. Y.	22
Sample, Blige & Co., St. Louis, Mo.	32
Helve Hammers, Makers of.	
Bradley Mfg. Co., Syracuse, N. Y.	25
Hoisting Engines, Makers of.	
Otis Bros. & Co., 818 Broadway, N. Y.	9
Horse Nails, Makers of.	
Assable Horse Nail Co., 35 Chambers, N. Y.	32
Brundage & Co., Middletown, N. Y.	32
Globe Nail Co., Boston, Mass.	32
Pratt & Co., Buffalo, N. Y.	32
Putnam S. S. & Co., Neponset, Mass.	32
Horse Shoes, Makers of.	
Burden Iron Works, Troy, N. Y.	4
Hubs and Spokes, Mfrs. of.	
Gleason J. & Co., 2nd and Diamond, Phila.	12
Ice Cream Freezers, Makers of.	
Blanchet C. G., 506 Commerce, Phila.	7
Providence Tool Co., 11 Warren, N. Y.	7
Shepard Sidney & Co., Buffalo, N. Y.	21
Torry E. S. & J., 166 Fulton, N. Y.	21
Insurance, Boiler.	
Hartford Steam Boiler and Inspection Co.	13
Insurance Fire and Marine.	
National Fire Ins. Co., 52 Wall, N. Y.	30
Iron Brokers.	
Boydton Geo. A., 20 Wall, N. Y.	4
Hazard & Jones, 212 Wall, N. Y.	4
Pettit Wm. H., 72 Wall, N. Y.	4
Iron, Corrugated, Manufacturers of.	
Corrugated Metal Co., East Berlin, Conn.	15
Iron, Charcoal, Warm or Cold Blast.	
Quincy John W., 93 William, N. Y.	4
Iron Commission Merchants.	
Blackiston & Cox, 333 Walnut, Phila.	13
Hand Jas. C. & Co., 614 and 616 Market, Phila.	13
Main Bros., 228 Dock, Phila.	6
Iron Pig, Importers of.	
Williamson James & Co., 69 Wall, N. Y.	4
Iron Dealers.	
Abel Brothers, 120 South, N. Y.	4
Bigelow & Johnson, 65 Pine, N. Y.	4
Bonnett, Botsford & Co., Co. Youngstown, O.	4
Borden & Lovell, 30 and 71 West, N. Y.	4
Buchanan Geo., 19 Birchen Lane, London, E. C.	6
Cleveland, Brown & Co., Cleveland, O.	4
Coddington T. H. & Co., 25 Cliff, N. Y.	4
Conklin & Huerstel, 90 Market Slip, N. Y.	4
David & Wheeler, 78 Pine, N. Y.	4
Fuller, Lord & Co., 120 Greenwich, N. Y.	4
Fuller, Dana & Co., 110 North, Boston.	4
Gardner Wm., 575 Grand, N. Y.	4
Hall, Kimbark & Co., Chicago, N. Y.	4
Harrison & Gilson, 58 Wall, N. Y.	4
Jackson & Chase, 206 and 208 Franklin, N. Y.	4
Judson B. F., 451 and 453 Water, N. Y.	4
Mathews Chas. F., 123 Wall, N. Y.	4
Packard, Gott & Co., Youngstown, O.	4
Pearson & Co., 24 Broadway, N. Y.	4
Pope Thos. J. & Co., 24 Pearl, N. Y.	4
Railey John W., 38 William, N. Y.	4
Richards D. W. & Co., 62 Mangle St., N. Y.	4
Smith Gam'l G. & Co., 343 Pearl, N. Y.	4
Warner A. B. & Sons, 28 and 29 West, N. Y.	4
Williamson James & Co., 69 Wall, N. Y.	4
Whitney Alfred B., 58 Hudson, N. Y.	4
Iron, Manufacturers of.	
Atwater, Wheeler & Co., New Haven, Conn.	6
Britannia Iron Works, Middlebrook, Eng.	6
Burden Iron Works, Troy, N. Y.	6
Carrwright, McCurdy & Co., Cleveland, O.	6
Cleveland Rolling Mill Co., Cleveland, O.	6
Conlin Wm. E. & Co., 8 Oliver, Boston.	6
Ellis W. R. & Co., 100 Chambers, N. Y.	6
Everson, Graft & Macrum, Pittsburgh, Pa.	6
Fulton S. & Co., 412 Walnut, Phila.	6
Jones & Laughlin, Pittsburgh, Pa.	4
Leonard John, 420 and 421 West, N. Y.	6
Lynchburg Iron Works, Lynchburg, Va.	6
Mills, Mills Iron Co., Middletown, N. Y.	6
Niles Iron Co., Niles, O.	6
New Haven Rolling Mill Co., New Haven, Ct.	6
Old and New Works, 100 Chambers, N. Y.	6
Oxford Iron Co., 410 Washington, N. Y.	6
Phoenix Iron Co., 410 Walnut, Phila.	6
Rowland Wm. & Harvey, Phila.	6
Iron Hoop, Manufacturers of.	
Wm. Clark & Co., Pittsburgh, Pa.	4
Iron Sheet, Manufacturers of.	
Reese & Co., Pittsburgh, Pa.	4
Iron, Swedish, Importers of.	
Jessop Wm. & Sons, 91 and 93 John, N. Y.	28
Mittander Nils, 69 William, N. Y.	28
Page Ewd. & Co., Boston, N. Y. and Phila.	28
Lace Leather, Manufacturers of.	
Comp. Athol, 40 and 42 Beade, N. Y.	12
Stoyle Wm. H., 403 Liberty, Phila.	13
Lanterns, Manufacturers of.	
Howard & Morse, 45 Fulton, N. Y.	2
Lawn Mowers, Manufacturers of.	
Barlow & Walker, Sing Sing, N. Y.	14
Chadborn & Coldwell Mfg. Co., Newburgh, N. Y.	23
Lead and Tin Lined Lead Pipe, etc., Mfrs.	
Coldwell & Co., 314 Centre, S. Y.	2
Locks, Manufacturers of.	
Mallory, Wheeler & Co., New Haven, Conn.	27
Norwich Lock Co., Norwich, Conn.	22
Sargent, Greenleaf & Cole, 300 Broadway, N. Y.	14
Trenton Lock Co., 48 Warren, N. Y.	22
Wheeler Lock Mfg. Co., 30 Broadway, N. Y.	22
Machinery, Makers of.	
Fishkill Landing Mch. Co., 63 Bleecker, N. Y.	20
Greene D. A., 323 and 328 Delancy, N. Y.	21
Greene D. A., 323 and 328 Delancy, N. Y.	21
Morris Co. Machine and Iron Co., Dover, N. J.	30
Osapa Machine Co., New Hartford, Conn.	30
Osapa & Childs, 60 Chambers, N. Y.	30
Sellers Wm. & Co., 300 Hamilton, Phila.	21
Wason Andrew, 57 Dickinson, Phila.	21
Wheeler, Smith & Co., Newburgh, N. Y.	24
Machinery, Makers of.	
Lyon & Fellows Mfg. Co., Williamsburg, N. Y.	24
Machine's Tools, Makers of.	
Blackwell & Co., Worcester, Mass.	21
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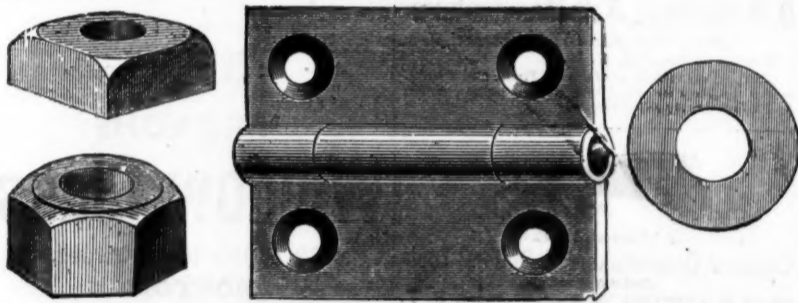
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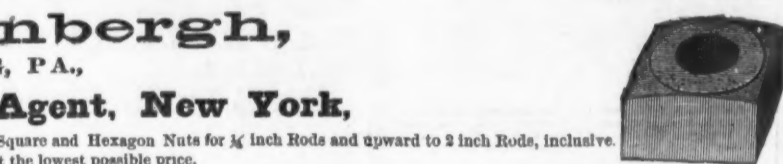
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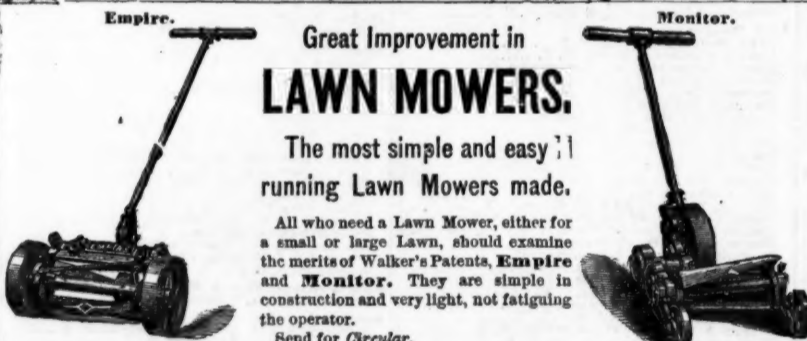
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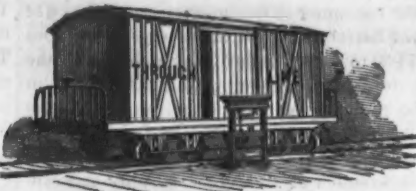
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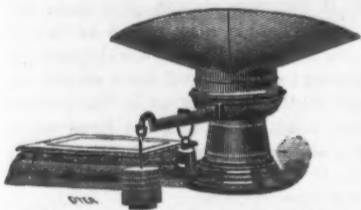
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For Goshen and Middletown, *7:30, 8:00, *8:30, 11:00 and *11:15 A. M., 3:30, 4:30, 5:30, *6:30 and *7:00 P. M.

For Warwick, 8:00, 11:00 and *11:15 A. M., 4:30 P. M.

For Newburgh, 8:00, *8:30, 9:00 and 11:00 A. M., 3:30, 4:30 and 5:30 P. M.

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The Iron Age is published every Thursday morning, at No. 10 Warren Street, New York, on the following terms:

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Nineteenth Page.—Trade Report (continued). Our English Letter. Table showing the production, importation and consumption of iron and steel rails in the United States in 1872 and preceding years; also the Average Price per Ton and the Number of Miles of Railroad Built in each Year. The Manufacture of Rails in the United States.
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Cheap Transportation by Rail.

A few years ago a plan of railway reform was suggested which attracted much attention, and was received with marked favor. The chief objects to be attained were a general reduction in freight rates, and an increase in transportation facilities; and the means by which these desirable results were to be brought about were freely discussed by Congress and the State Legislatures and warmly approved by the newspaper press. To facilitate the introduction of these reforms an association known as the "National Anti-Monopoly Cheap Freight Railway League" was organized, and many of our leading capitalists and best known practical statesmen were identified with the movement. So general was the acceptance of the plan of railway reform proposed by the League, that it might almost be said to have assumed a national character, and as many as seven bills were pending in Congress at one time proposing the establishment of as many different through railroads traversing the most productive and populous sections of the interior. One of these schemes provided the necessary facilities of cheap freight transportation for Kansas and Texas; another for the country between some central point on the Mississippi and the nearest Atlantic port; a third connected the anthracite and bituminous coal regions of Pennsylvania and Maryland with the New Jersey shore opposite New York; a fourth was projected through Georgia and the adjoining Gulf States; a fifth through Virginia and the Carolinas; a sixth through Alabama and Northern Florida; and a seventh from the head of lake navigation through the wheat-growing section of the Northwest. This system of trunk roads, exclusive of the branches and connections to be built for local accommodation, was to have required about four

thousand miles of double track, which, at an average cost of \$50,000 per mile, would have represented an invested capital of \$200,000,000. This money was to have been obtained from the sale of actual shares, and ample precautions were to be taken to prevent the possibility of those "irregular" transactions which have given the stock of so many important railway enterprises a doubtful reputation among prudent investors.

Why the public interest in this movement was allowed to fail, or why the several projects were abandoned, we do not know. Probably the movement was premature, and the financial difficulties in the way of such undertaking too great to be overcome; but we see that an effort is now making to revive the movement, and that the advocates of reform are seeking the support and co-operation of the disaffected producers of the West, who are clamoring for lower rates of transportation for their cheap and bulky products, which cannot bear heavy tolls. What claim the existing "Anti-Monopoly Cheap Freight Railway League" may have upon the public confidence we do not know, but the plan they propose is certainly a good one and merits consideration. Their avowed object is to encourage the construction of railroads for cheap freight transportation, upon which frequent and slow trains shall be run, and which shall be open as public highways to competing forwarders, who may run and operate their own rolling stock upon payment of mileage tolls. On such a road, if well managed, freights should be profitably carried at rates far below the average of those now charged. The present high cost of freight transportation is easily accounted for. Most companies, owing to the hollowness of their financial basis, are compelled to declare dividends upon from forty to sixty per cent. more capital than is represented in the actual value of their roads and equipments. The number of trains run upon these roads is comparatively small, and these are driven at a rate of speed which materially damages the road bed, ruins the rolling stock and consumes extravagant quantities of fuel. To realize a sufficient profit upon business under such a ruinous system of management, the companies are compelled to charge high rates upon freights and passengers, and the public is not only taxed to pay interest upon fictitious capital, but to repair the costly and constant damages to roads and rolling stock. But suppose that one of these roads, if favorably situated for such an experiment, should be devoted by its managers to the business of transporting freights at rates one-half lower than those charged upon competing lines, and instead of running twenty mixed trains a day at a ruinous and dangerous speed, it should run a hundred freight trains an average rate of eight or ten miles per hour. It requires no arguments to prove that such a road would thus vastly increase its capacity for business without proportionally increasing its operating expenses, allowing for diminished wear and tear and the greater economy of fuel in proportion to mileage. Relieve such a road of the burden of a debt for which it has nothing to show but fictitious capital stock; run trains upon it at a moderate speed and as often as business may require, charging no more for freights than may be necessary to pay expenses, plus a legal interest on the capital actually invested; open it to any forwarder or transportation company that might choose to run cars upon it, and the question of cheap transportation by rail would be practically solved.

It was this system which was advocated by the Cheap Freight Railway League, and which, we believe, is now urged by those who are reorganizing the movement on a more comprehensive and permanent basis. Unlike most movements in this direction, it is founded on a practical, common sense idea, which will stand the test of experiment. On a freight railroad constructed and managed under conditions favorable to economy, and operated with the advantage of uniformly moderate train speed, it has been estimated by competent railroad authorities that freight might be carried from the Ohio River to the seaboard for \$4 per ton. This would amount to about 40 cents per barrel on flour and 12 cents per bushel on grain. Double these rates, and the facilities thus offered would still attract much of the wasted production of the West to a profitable market, and largely stimulate the development of the agricultural and industrial resources of the districts tributary to the business of such a road as we have described. That such reforms in railroad management as will render cheap transportation possible are imperatively demanded in the interests of both the producers, consumers, and exporters of domestic commodities, the public does not need to be informed. Even with our vast and rapidly-extending railroad system, embracing upward of 70,000 miles of road in operation, there does not exist between the different sections of the country that free interchange of products and commodities which is essential to the

full prosperity of all sections. For example, while the West produces a much larger surplus of corn and grain than can be profitably marketed, a fair quality of flour costs the consumer in this market from \$8 to \$12 per barrel, and good wheat is quoted at from \$1.50 to \$3 per bushel; and in the South the cotton planters are turning their attention to growing the very crops for which the Western farmers cannot find a profitable market. Again, while in the seaboard markets lumber of all kinds is steadily and rapidly increasing in value, thousands of acres in the West are every year burned off, in order to clear them of their valuable forest growths; and while in some sections, where wood is scarce, corn is burned for fuel, the coal operators of Pennsylvania find annual cause for complaint in dullness of trade, low prices and accumulation of stocks. Such a condition of affairs is, certainly, not conducive to the attainment of the fullest measure of national prosperity, and if, as we believe, a promise of relief is found in the economical construction of railways to be devoted to the transportation of freight under the conditions above indicated, by all means let the discussion be continued until the system has been fully and fairly tested. We wish those engaged in this movement every success, and promise hearty co-operation with all well-directed efforts to secure the desired reforms.

Protection to Individuals from Trade Union Outrages.

The Legislature of the State of Illinois has just enacted a statute, which merits favorable consideration from the law making powers of other States. Its object is the suppression of trade union outrages, which have become only too common of late throughout the country; and while the fact that such laws are needed in this enlightened century, and, more especially, in this highly civilized country, is a phenomenon which merits the serious consideration of sociologists and economists, it must be admitted that they are needed and that, when enacted, they should be rigidly and impartially enforced by the courts. The first section of the law in question recognizes in the clearest manner the right of every man to absolute freedom of action in the sale of his labor, and declares it a misdemeanor for any person to interfere with him in the exercise of this right. We quote as follows: "If any person shall, by threat, intimidation, or unlawful interference, seek to prevent any other person from working, or from obtaining work, at any lawful business on any terms that he or she may see fit, such person so offending shall be deemed guilty of a misdemeanor, and on conviction thereof shall be fined in any sum not exceeding \$100." In other words, the statute guarantees to individual workmen the protection from molestation which they are accorded in both common and statutory law. Threats and intimidations are both recognized as misdemeanors already, which, when proven, render the person making or taking part in them liable to prosecution, and it is only because of the necessity which exists at the present time for laws especially applicable to trade unions, that any distinct affirmation of this fundamental principle of common law is needed. To convict a man under this law for interfering with another, the fact of "unlawful interference" must be established, and although the term "unlawful" is sufficiently elastic to cover almost all varieties of actual offenses against the persons and rights of workmen, it will tend to prevent any unjust interpretation of the meaning and intent of the act. This, it will be seen, renders the Illinois law open to none of the objections which have been urged against the English conspiracy law. An act of aggression against the person, property or rights of another, in itself unlawful, must be established before the person accused of misdemeanor under the new law becomes amenable to its penalties. No workman who respects the laws already in force for the protection of the peace of society and the suppression of violence and wrong doing—laws under which he claims protection for himself and family from evil minded persons—has any reason to complain that injustice is done him in this statute, or that it renders him, as a workman, subject to any restraint to which he is not required to submit as a citizen.

It is due to the independent workmen of this State, who have withdrawn from, or refused to affiliate with, the trade unions, that such a law be passed for their protection. In a case of this kind "special legislation" is necessary. The trade unions are strong and influential, and number among their members many who, unrestrained by any moral considerations, are dangerous tools in the hands of unscrupulous leaders. As we have seen during the past few months, in a who work when the trade unions on a strike do so at the risk of their lives, and too often they learn from bitter experience how heavy is the hand of trade union tyranny. Parties of armed

ruffians waylay them in the streets, on their way to and from their work, and if threats are unavailing bludgeons, stones and, sometimes, pistols are called into requisition. This is a phase of lawlessness which demands prompt and effectual suppression. The State owes to the non-union workingmen, as citizens, a duty which it should not neglect. No other class of law-abiding citizens is exposed to the same dangers; no other class is so powerless to protect itself.

The Gardner Elevated Railway.

A bill has passed the Senate, and, at the time of this writing, awaits consideration in the Assembly, which is of the greatest possible importance to the business community of this city. We refer to the bill incorporating the Gardner Elevated Railway. The company seeking this charter propose the construction of an elevated steam railroad, to extend from the Battery to One Hundred and Sixty-first street, on the west side; thence across to the Harlem River, and down the east side to the Battery again. It can take any position within 200 feet of the water on the west side, and within 250 feet on the east side. The tracks may be two or one, elevated or on the surface. Grounds, depots, stations, side-tracks, switches, turntables and storehouses may be stationed anywhere. A roadway 100 feet wide is allowed. The bill empowers the building of ten piers and wharves, ten docks or slips, as large as the case may require, and permission to run them as a corporation under the warehouse law. Cars may be loaded right from the steamship. This is intended to break up the warehouse and cartage system which has long operated to the serious disadvantage of our commercial interests. The capital stock of the company is about \$16,000,000, and as soon as one-quarter is subscribed and one-tenth paid in work may begin. In compensation for its valuable franchises, the company is to pay into the city treasury a sum equal to 3 per cent. of its declared dividends.

We are not prepared to approve this scheme until we know more fully the precise plans of its projectors, and whether there is any "job" concealed in the provisions of the bill. The fact that all the New York Senators voted against it proves nothing. We have long urged the necessity for a marginal freight railway that should connect all points along our water fronts with convenient and capacious warehouses, thereby reducing the enormous expense of local cartage which imposes such heavy taxes upon our commerce; and the plan of the Gardner railway seems to meet the requirements of trade as fully as any which could be proposed. If, however, there is anything objectionable in the bill it is quite certain to be discovered and ventilated before it receives the Governor's approval. General Dix is beyond the reach of any corrupt influence, and as he is well acquainted with the needs of the city and in the confidence of its leading merchants, he may be trusted to deal with the bill as it deserves, if it ever reaches his hands. There can be no difference of opinion as to the necessity for the substitution of steam for horse power in the movement of the volume of freights which reach our city from so many conveying channels of land and water transportation; and in deciding what system is best and cheapest, we must not lose sight of the fact that our insular position necessitates the adoption of systems different from those which might be adopted by other cities with advantage.

It is a fact pretty well understood by this time, that the system of bridge construction known as the "Truesdell pattern" is altogether untrustworthy, and that its only recommendation is cheapness. The first bridge of this pattern, constructed across Rock River, at Elgin, fell in 1868. It was rebuilt on the same plan, and on the 5th of July, while moderately crowded with people witnessing a boat race, it fell a second time. Several other "accidents" of a like nature are on record against this method of construction, the last and most fatal of which is the fall of the bridge at Dixon, commented on in our issue of last week. The defects of this method of construction were fully exposed some years ago by the Chicago newspaper press, such a bridge having been erected in that city. Competent and impartial engineers were employed to examine the structure, and the decision was that, if loaded with anything like the weight it was expected to carry, it would certainly break down. No answer was made by the owners of the Truesdell patent to this exposure, but they have gone on building bridges ever since, and many are now standing which, when subjected to an unusual strain, may be expected to give way without warning. The fact that so many worthless structures have been put up on this and other defective systems shows the necessity for the employment of first-class engineering talent to assist the deliberations of town and city authorities, upon whom devotes the duty of making contracts for necessary bridges. Supervisors and Common Councilmen are

not, as the rule, experts in such matters, and when two or more systems are presented to them for approval which seem equally meritorious, it is only natural that they should choose the cheapest, though the economy thereby effected may prove very costly in the end.

We publish this week an interesting article on "The Present Aspect of the Labor Question," embodying the views of many employers and manufacturers, as expressed in conversations with our reporters with regard to the threatened eight hour strike, which was to have been declared this season. The general opinion among those best acquainted with the temper of the trade unions is, that no general demonstration will be ventured upon this spring, as business generally is so dull, and the principal industries—especially those connected with building operations—are still suffering so severely from the consequences of the last strike, that employers would promptly close their shops if the men should give them any trouble. There is, also, reason to believe that the more intelligent workmen are beginning to understand more clearly the simple truth, that a strike is like a sword without a hilt, wounding the hand which wields it; and that what ever operates injuriously to the interests of capital must at once react upon labor, by decreasing the demand for it and stimulating a competition among workmen which tends to reduce wages. It is evident, however, that the trade unions are still controlled by men who are more skillful as demagogues than as mechanics, and that they are ready to make trouble as soon as an opportunity shall offer. An interesting feature of the article to which reference is made above, is the condensation of an unpublished report of the "Employers' Central Executive Committee," which we commend to the notice of our readers.

The account, published in another column, of the trial trip of the steamer Pennsylvania, the pioneer vessel of the new American line, will be read with interest. If her performances are correctly reported—and we have no reason to suppose that they are not—she is likely to prove an unusually economical and profitable vessel in service. An account was kept of the coal consumed, and on the second day out her consumption was a little less than thirty-one tons in twenty-four hours. As the contract made with Messrs. Cramp, the builders, specifies that her coal consumption shall not exceed forty tons per day, this was an unexpected economy, which, however, gave a great deal of satisfaction to the officers and stockholders of the company. The best time was a run of 102 miles in 6 hours—an average of 17 miles per hour. A more satisfactory trial trip could not have been desired, and the new ship certainly does great credit to her builders and to the managers of the company. She is now preparing for her first trip to Liverpool, and is expected to sail on Thursday, the 22d inst. We wish her many safe and prosperous voyages.

Elsewhere, we publish a part of the inaugural address of Mr. I. Lowthian Bell, delivered before the British Iron and Steel Institute at its recent meeting in Glasgow. The address is of unusual interest, reviewing the latest and most valuable improvements in the metallurgy of iron, and it merits the careful perusal of American ironmasters. Mr. Bell is one of the most scientific metallurgists of England, and he is a worthy successor of Mr. Bessemer in the Chair of the Institute. We shall give the remainder of the paper in our next issue.

The Present Aspect of the Labor Question.

There is no longer any reason to fear a general eight-hour strike this season. The testimony of the principal employers of the city is, that no concerted strike of the various trades will occur, and it is thought probable that such strikes as do occur will be local and restricted to a few trades.

This opinion is based upon the general condition of the labor market. The universal dullness in the various branches of industry would doom a strike to certain failure. This is especially true of the building trades, upon whom the strike of last June fell most oppressively. It is estimated that the loss to the building industry of New York during the last year, on account of the work formerly done in the city that has been transferred to the country, and the work that has been suspended altogether, is \$6,000,000. The architectural iron interest was almost paralyzed by the strike, and with very slight exceptions it may be said that the various firms are doing nothing at all. The outlook before the strike last year in this department was very promising, many contracts were taken, but the subsequent strike of the men placed every employer in a most trying position. The result has been that many contracts were allowed to lapse, and others were carried through at a heavy loss, and the effects of the strike have perpetuated themselves to the present season. The poor prospects of a recovery from this state of

things have made the men very reasonable. In the manufacturing interests, also, trade is dull, and a successful general strike for eight hours would be impossible. An incident which shows the temper of the mechanics occurred a few days ago in a large manufacturing establishment. A large body of men presented, recently, a respectful petition to their employer, asking for a concession which was offered to them last year during their resistance, and which was withdrawn on account of their not accepting it. The petition in this case, however, was coupled with a proviso that, in case it was not granted, the petitioners would not strike.

The temper of the employers has also changed, and an almost universal determination is evinced not to submit to further aggressions. As they have expressed it, they are certain to be crushed if the demand for the eight-hour system is acceded to, and they may as well die in the struggle to resist it. It has become apparent, also, that there is but little use of conferring with a committee from the men, as such bodies are always bound to report in one manner, or else they are charged by their constituents with bad faith. It has been found better to call the whole force of men together and discuss the matter with them, in order to have a clear understanding of the relations between them.

In addition to these things, a better understanding has been obtained between the employers and their men. There is a very extensive party among the laboring classes who do not sympathize with the aggressions which have been made by the trade unions, etc. These, are the best mechanics, who realize that they are able to earn an excellent subsistence by receiving pay proportionate to the work they perform. They realize, also, that the effect of compulsory measures is to bring them to a level of the poorer workmen, and while they are carried along with the current of popular feeling, they are, nevertheless, not in hearty sympathy with aggressive movements. These men can be reasoned with and are quick to see their own interests. The promoters of strikes, on the contrary, are usually indifferent workmen, who like any pretext for being in idleness at the expense of the union treasuries. In almost all cases where a spirit of conciliation and a good temper exists on the part of the employer, it is possible to create a sentiment among the more intelligent mechanics which is favorable to their own interests and the establishment of an equitable arrangement. This fact became very fully understood during last year's strike, and its use by various employers had a great influence in modifying the effects of the revolt. The methods of resisting the movement last year, resorted to by Mr. John Roach, of the Morgan Iron Works, were very successful, and the failure of this shop to give effective co-operation to the strike was a great obstacle in the way of its success. When the eight hour law was passed Mr. Roach accepted it, and placed in various portions of his shop the following notice: "The bell will ring as usual at the commencement of every hour. Every mechanic is privileged to work six, eight or ten hours, as he sees fit, and he will be paid by the hour. If, on account of my improved machinery, any men can be dispensed with, preference will be given to men working ten hours." The result was that very few chose to work less than ten hours. The protection of the mechanic in the privilege of working as many hours as he sees fit, and being paid in proportion to the work performed, was fully recognized in this shop with the happiest results. The right of the mechanic to take his labor wherever he should receive the most for it, with the privilege of returning whenever he should be needed and he should see fit, was also admitted by Mr. Roach, and this fact contributed not a little to the establishment of order in the shop and to the prevention of a serious uprising. It is believed, therefore, that a careful attention to the rights of the men, and a consultation with the better class of mechanics, would prevent a strike were one imminent.

As to the co-operation of employers among each other, it is very probable that there will never be any effective union of the kind. When there is danger of a concerted labor revolt, employers are ready to combine together and hold meetings and put up money, but each one considers his duty at an end when there is no longer danger of disturbances in his own shop. There is at present no general union of employers, although the committee appointed by a meeting of employers to investigate the causes of the strike have strongly recommended it. This committee, indeed, exists, and have authority to call a meeting of employers whenever an emergency demands a gathering; but no meeting has been held for several months. The committee was appointed on June 18th, 1872, and is known as the Employers' Central Executive Committee. It consists at present of Messrs. A. S. Cameron, John Roach, John W. Britton, John Matthews and George Heyman. Its powers are: "To call meetings, to draft rules for the government of employers, to submit plans for their consideration, and to take such other action for the protection of manufacturers and other employers as may be best calculated to bring about a concert of action." The report of this committee embraces much that is interesting relative to last year's strike and the causes of strikes generally. As it has never appeared in print, we have taken the liberty of making liberal quotations from it. Their recommendations were as follows:

First—That workmen be employed and paid by the hour, because it would open the door to the establishment of harmony between the duration of the laborer's day and the nature of the labor performed, which can never be done in a violent manner.

Second—When strikes occur it would be wise for employers to meet in consultation, in order to determine the best course to pursue.

Third—It would be well for employers to discourage trades unions by every fair means;

by insisting on their right to employ workmen independent of any restriction imposed by a combination of men; by extending encouragement and protection to independent workmen who desire to improve their condition by working longer hours or by extra exertions; by the introduction of the piece work system as far as possible; by an extensive employment of apprentices under regulations that would insure their being trained as master workmen.

Fourth—It would be well to take a kindly interest in the welfare of their employees, by seeing that their individual efforts are appreciated.

Finally—It would be wise for employers to encourage by their example everything that tends to perpetuate the dignity of labor by training up their children in such a manner that each may become the master of some trade.

The committee kept itself in communication with the newspapers, and by consultation with the reporters, succeeded in influencing the tone of the public press. They next appealed to the intelligence of the better class of workmen by putting in their hands a pamphlet printed in English and German. This pamphlet exerted a great influence over the more sensible mechanics.

The committee estimate that during the last strike some forty thousand men were idle. The inspiration of the strike seemed to come from Unions, Leagues, etc., "and the spirit of the whole movement seemed to emanate from a few irresponsible demagogues, who were actively employed in exciting uneasiness among our mechanics." It is also claimed that emissaries from England tampered with our working classes, with the purpose of exciting disorder among them, for the benefit of foreign capitalists. Large bodies of idle men moved about the city to give an appearance of strength to the strike. About one-half of the manufacturing were idle, and trade was paralyzed.

In the prosecution of their inquiries the committee heard complaints from all quarters of the lack of superior workmen, and of the opposition of trades unions to apprentices. The old system of educating master workmen is passing away, and this fact is due to several causes: the tyranny of trades unions, inventions in labor saving machinery, improved methods of conducting work, inflation of values and the influence of the late war, during which unskilled labor was employed to do work that was before trusted only to experienced men. The system of a division of labor, of men working "in teams," as it is called, is spreading rapidly. The work is divided up as far as possible, so that one man does the same thing all the time, and, if he leaves, his place can easily be filled.

The committee charge the employers with a large proportion of the blame, for the want of harmony now existing, since they frequently conduct their business in an exclusive manner as regards others engaged in the same branch of industry. The employer usually regards another in the same line of business as a rival, and hence follows a cutting and carving policy on account of which few succeed. The committee recommend that employers engaged in the same business meet at intervals and discuss the principles of their business, and act in concert. In the management of their workmen employers are pronounced equally at fault. If a demand is made by the men, they either submit or shut up their places, and reduce the question to one of brute force. The evil results of such a policy were illustrated in the famous engineers' strike in Newcastle last year. The committee of employers, of which Sir William Armstrong was chairman, would not even treat with the men, but sent them in answer to a respectful request for a conference, a freezing letter written by their attorneys. The effort was repeated several times but with similar success. Matters were allowed to go on until the employers were obliged to yield in the most humiliating way. A conference would have adjusted the matter in a simple manner, but a long strike was necessary to settle the question, which entailed heavy losses and great suffering. The committee devoted much time to a serious consideration of the duty of employers to look after the interests of their men by providing a room, for instance, where they could read or enjoy light amusements, and by establishing a more general intimacy with them. If, however, employers keep aloof from their men, simply studying how cheaply they can employ them, they should not complain, say the committee, at repeated strikes, for it cannot be expected that an advance of wages will always satisfy discontented workmen.

Trial Trip of the Steamer Pennsylvania.

Our Philadelphia exchanges contain the following particulars of the trial trip of the new iron steamship, Pennsylvania, of the American line:

The ship left her moorings on Monday, and in the course of the afternoon reached the breakwater. Here she rode at anchor all night, proceeding at daybreak along the New Jersey coast. During the day there was no severe pressure as to speed, the object being to get everything working smooth about the engines, and to accustom the crew to their various duties.

The United States engineers, who were on board for the purpose of observing the working of the engines and the consumption of coal, ascertained that in four hours she made 48 miles, with a consumption of coal at the rate of 33 tons of coal for 24 hours. This was an economy of coal that was not expected, as the contract with the builders, the Messrs. Cramp, specifies that her consumption of coal shall not exceed 40 tons per 24 hours. An accurate account of the coal consumed was kept during the whole of the second day out, and it was ascertained that the consumption was a fraction less than 31 tons.

The Pennsylvania left Cape Henlopen at 8 a. m., was abreast five-fathom-bank light-ship at 10:30; Abascoin bore west at 2 p. m., Barnegat bore west at 4 p. m., reached the Sandy Hook light-ship at 7:30 p. m. At this point she turned

off to the eastward and ran 83 miles, and at 3 o'clock on Wednesday morning was in latitude 40° 3', longitude 73°. From this point she returned on her course, and was abreast of Sandy Hook light at 10 a. m., having made 173 miles in 14½ hours, or a fraction less than 12 miles an hour. The whole distance run in 26 hours was 303 miles. Opposite Sandy Hook light-ship further observations were made for regulating the compasses, detaining the ship nearly two hours.

The homeward course was then resumed, and the distance between Sandy Hook light and Barnegat, 42 miles, was run in 3 hours and 20', which is equal to 12½ knots per hour, and from Barnegat to Abascoin light, 25½ miles in 2 hours and 5', equal to 12½ knots per hour.

During the whole trip, up to Wednesday evening, the weather had been calm and beautiful, and the sea smooth. As dark approached on Wednesday evening the wind freshened, and betokened a change in the weather and a north-east storm. This was so much more favorable for testing the qualities of the ship and machinery than the smooth water over which she had previously glided, that it was determined to remain outside of the bay until near morning, and thus complete the 48 hours continuous running of her engines at sea. She reached the five-fathom-bank light-ship about dark, and the balance of the night was spent in cruising between it and Cape Henlopen light, until 4 o'clock a. m., when the bay was entered and a direct homeward course taken.

Passing the breakwater at 4:30 a. m., on Thursday morning, the Pennsylvania made a most remarkable run up the river, anchoring below the navy yard at 10:30, having accomplished 102 miles in exactly six hours, being at the rate of 17 miles an hour.

During the run up the river the guests assembled in the dining saloon, and on motion, Captain James West was called to preside. Ex-Mayor Fox spoke in commendation of the noble qualities of the ship and of the hospitalities accorded to the guests. On his motion a committee was appointed to draft a series of resolutions expressive of the sense of the meeting.

The following resolutions were reported by the committee and unanimously adopted:

Resolved, That the eminent success of the trial trip of the steamship Pennsylvania inaugurates a new era in American commerce, and that it should be a source of the utmost gratification and pride not only to the people of Philadelphia, but to all American citizens, that there has at length been established a line of first-class transatlantic steamers that will sail under the flag of the United States—these vessels being equal in point of equipment and efficiency to any in the world, and promising to every patriotic American the rapid development of our steam commerce.

Resolved, That in order to meet the rapid growth of our intercourse with other nations, we hope that the people of America will provide American ships from all our leading ports, so that our country will control a proper share of the commercial marine required to carry the products interchanged between America and all other countries with which we have commercial relations.

Resolved, That great credit is due to J. Edgar Thomson, President, and the Board of Directors of the Pennsylvania Railroad Company, for the liberal aid, financial and otherwise, that they have extended to the merchants, manufacturers and the citizens generally of Philadelphia, for the purpose of enabling them to establish and maintain this important means of communication between the new world and the old.

Resolved, That our warmest acknowledgments are due to Captain Sumner and his officers, engineers and employees of the ship, for the skill and attention which they have exhibited in the performance of their respective duties. They have contributed in every way possible to our safety and comfort. And in this connection we also desire to thank Captain Lester Schellenger for the able services he has rendered in his very important and responsible office of pilot.

Resolved, That we desire to express our sense of the delicate hospitality extended to us by Mr. E. C. Knight, President, and the Board of Directors of the American Steamship Company during the four days we have spent on board the good ship Pennsylvania, and before separating from them we must be allowed to wish them abundant success in all their undertakings, and especially do we invoke the blessing of Providence upon the inauguration of this new and important element of commercial progress.

The Pennsylvania will now be prepared for her first trip to Liverpool, and will probably sail on Thursday, the 23d inst.

A correspondent, writing from Sheffield, says: "I have seen a new method of rolling sheet steel which has been tried with some success in one or two of the steel works of this town. It involves the adoption of what is termed a three I sheet roller, instead of the two ordinarily used. So far as my information goes, it would appear to be very well adapted for plough plates, clip plates, and for moulding out purposes, but hardly seems suited for broad sheet, or where a finished surface of any width is required. I understand that it saves some time and heating, although requiring another man or two to work it, and is likely to be adopted by one of the leading firms in the trade."

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A Superintendent for a new Boiler Plate Rolling Mill. Must come well recommended. Can have an interest if desired. Address

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The following second-hand Machinists' and Wood

Tools, all in first-rate order.

1 Engine Lathe, 32 in. swing, 16 ft. bed, turns 9 ft.,

screw feed, with 4 jawed chuck face-plate with 2

compound rests.

1 Engine Lathe, screw feed, 22 in. swing, turns 5 ft.

1 " " " " 22 in. " " 11 ft.

1 " " " " 26 in. " " 10 ft.

1 Shaping Machine 15 in. stroke.

1 " " " " 6 in. " " Gou'd's.

1 Shaft Straightening Machine.

1 Improved blacksmith's Hand Bolt Making Machine

1 Key Seat Cutting or Milling Machine.

1 Stover's Planer to plane 25 ft. by 34 in. wide.

1 Circular Saw Table and Saw.

Specular Iron Ore Lands

For Sale,

Containing a pure, fine grained ore in inexhaustible quantities and easily worked. Apply to

A. J. LINDSAY, Toronto, Canada.

Great Bargain

and Rare Chance for Investment.

I offer For Sale 18,000 Acres of the best selected Mineral and Agricultural Lands in the State of Missouri. A greater portion of the same is situated adjoining the Atlantic and Pacific Railroad, and only from 55 to 65 miles from St. Louis. The said Lands were bought from the government 22 years ago, and selected with the assistance of a well known scientific geologist, both for their mineral and agricultural wealth; and flattering prospects for Iron, Copper and Lead have been discovered. These Lands will be sold very cheap, and are a splendid opportunity for investment. Warranty deed given.

For particulars apply to

CHARLES RUEPPEL,

No. 25 South Main Street, St. Louis, Mo.

HARDWARE STORE

For Sale.

Stock well assorted, and good reasons for selling.

Location good.

Address G. R., Office of *The Iron Age*, 10 Warren

Street, N. Y.

Spathic Iron Ore Mine, Furnace

and Appurtenances For Sale.

The Shepang Iron Co. desire to sell their property located at Roxbury, Conn., consisting of a nearly new Iron Furnace, adjoining the Shepang Valley Railroad, by which Salisbury Iron Ore can be cheaply delivered directly at the Furnace; a valuable Mine of Spathic Iron Ore, extensively opened, and the quality of the ore fully proved by the American Silver Steel Co. to be superior to any in the country for Steel or superior Iron; a large amount of said Ore now delivered at the Furnace, and much larger quantity ready for stoping in the mine; 300,000 bushels Charcoal in the sheds; 1300 acres of Wood Land, owned in fee; 6000 cords of Wood purchased, and abundance of Wood obtainable in the vicinity at a fair price for the Furnace. Hot Blast, Railroad Track, Tenements, Sheds and Machinery are in good repair. The Furnace can be started in sixty days. Terms of payment easy. Would join with other satisfactory parties who will furnish cash capital and skill to improve the property.

Inquire of ROBERT E. DAY, President.

Hartford, Conn.

For Sale or To Lease.

A new Foundry, situated in Peekskill, Westches-

ter Co., N. Y., with a good water front.

Terms easy. Inquire of

A. H. FREE,

Peekskill, N. Y.

FOR SALE.

The Oxford Hot Blast Charcoal Iron Furnace, situated on Beaver Creek, 6 miles below Lynchburg, Va., and one mile from James River Canal.

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, May 16, 1873.

During the past week Wall street has enjoyed the advantages of an easy money market, call loans having been readily obtainable at 5 @ 7 per cent.; and the probabilities are in favor of easy money throughout the summer, unless a change occurs in the condition of affairs in Europe, which will weaken the banks by causing considerable shipments of specie to the Continent. This, however, is not feared, and the immediate outlook is encouraging. During the week there has been an improved demand for mercantile paper, choice names being freely discounted at 7 per cent. This, with the extension of bank loans, is favorable to an improvement in general trade.

The gold market has been firm during the week, with an advance in the premium, which led to a subsequent depression by causing some of the large holders to sell freely. The following will show the range of the premium:

Highest. Lowest.
Thursday.....117 1/2 117 1/2
Friday.....117 1/2 117 1/2
Saturday.....117 1/2 117 1/2
Monday.....117 1/2 117 1/2
Tuesday.....117 1/2 117 1/2
Wednesday.....117 1/2 117 1/2

The stock market has been without important feature, though ruling lower than during the previous week. The principal dealings have been in Western Union, Union Pacific, Pacific Mail, Ohio, Lake Shore, N. Y. Central, Rock Island, St. Paul, C. C. & I. C., and Erie. The highest and lowest of to-day's quotations are given below.

The bond market has been quiet, but prices advanced in sympathy with gold. State bonds have been dull and railroad mortgages steady on a very moderate demand. The closing prices of governments are given below.

The following tables show the foreign trade movements for the week:

	1871.	1872.	1873.
Tot. for week.....	\$5,561,631	\$7,425,926	\$6,387,442
Prev. reported.....	133,147,559	155,892,595	156,837,735
Since Jan. 1.....	\$139,709,150	\$163,318,821	\$163,235,177

Included in the imports of general merchandise for the week are:

	Quant.	Value.
Woolen goods.....	150	\$1,893
Brass goods.....	10	1,674
Bismuth.....	2	1,420
Bronzes.....	3	2,099
Chains and anchors.....	137	7,311
Copper.....	42,513	42,513
Cutlery.....	1	439
Gum fixtures.....	6	5,065
Hardware.....	31	4,322
Iron, hoop, tons.....	20	4,017
Iron, pigs, tons.....	2,641	95,778
Iron, sheet, tons.....	24	3,563
Iron, cotton ties.....	8,231	124,968
Iron tubes.....	1,100	3,000
Iron, other, tons.....	792	46,225
Lead, pigs.....	4,839	27,322
Metal goods.....	137	21,904
Nails.....	13	8,595
Needles.....	7,551	7,551
Of metal.....	2,095	2,095
Platina.....	1	951
Per caps.....	23	3,120
Saddlery.....	4,050	34,512
Steel.....	331,256	16,315
Splitter.....	3	638
Tin, boxes.....	29,042	29,042
Tin, 603 slabs.....	23,054	7,163
Wire.....	209	12,805
Zinc.....	27,911	15,969

	1871.	1872.	1873.
For the week.....	\$3,616,331	\$4,322,712	\$3,998,719
Previously reported.....	31,428,444	72,836,412	94,611,825
Since Jan. 1.....	\$85,086,377	\$77,159,135	\$100,640,538

EXPORTS OF SPECIE.

	1871.	1872.	1873.
For the week.....	\$551,246	\$551,246	\$551,246
Previously reported.....	17,696,897	17,696,897	17,696,897
Total since January 1, 1873.....	\$18,247,093	\$18,247,093	\$18,247,093

The bank statement shows that the banks hold now in lawful money \$4,620,250 above the 25 per cent. reserve which the national banks only are required by law to keep on hand. A gratifying feature of the statement is the increase in loans, which shows that the banks have been in a position to meet the wants of borrowers. The following is a comparison of the averages of the past two weeks:

	May 3.	May 10.	Differences.
Loans.....	\$370,731,100	\$374,657,970	\$3,926,870
Specie.....	128,867,800	129,261,000	393,200
Circulation.....	27,551,400	27,523,500	27,900
Deposits.....	196,471,900	202,819,100	6,347,200
Leg. Ten.....	40,051,700	41,941,300	1,889,600

Government bonds at the close were steady. We quote:

	Bid.	Asked.
U. S. Currency 6s.....	115 1/2	116
U. S. 6s, 1881, reg.....	115 1/2	116 1/2
U. S. 6s, 1881, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1882, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1884, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1885, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1887, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1888, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1889, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1890, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1891, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1892, c. Jan. and Nov.....	115 1/2	116 1/2
U. S. 6s, 1893, c. Jan. and Nov.....	115 1/2	116 1/2

The following were the highest and lowest prices of stocks to-day:

	Highest.	Lowest.
N. Y. Cen. & Hudson Consolidated.....	100 1/2	100 1/2
Lake Shore.....	100 1/2	100 1/2
Rock Island.....	100 1/2	100 1/2
Wabash.....	62 1/2	62 1/2
Harlem.....	126 1/2	126 1/2
Western Union Telegraph.....	80 1/2	80 1/2
Midvale & St. Paul.....	53 1/2	53 1/2
Pennsylvania.....	110 1/2	110 1/2
Pacific Mail.....	59 1/2	59 1/2
Erie.....	59 1/2	59 1/2
Ohio & Mississippi.....	43 1/2	43 1/2
Boston, Hartford & Erie.....	31 1/2	31 1/2
Union Pacific.....	31 1/2	31 1/2
C. C. & I. C.....	31 1/2	31 1/2
Consolidation Coal.....	56 1/2	56 1/2
Wells, Fargo & Co. Express.....	80 1/2	80 1/2

GENERAL HARDWARE.

In pursuance of a call signed by Hull Clark, John P. Coffin, Samuel Coulter, George H. Sargent, and Richard P. Bruff, a meeting of the Hardware trade was held at the office of the Russell & Erwin Mfg. Co., on Saturday last, to take action in reference to the death of Hon. Oakes Ames. Hull Clark was appointed Chairman and Richard P. Bruff, Secretary. A committee appointed by the Chair, consisting of Messrs. Mulford, King and Bruff, reported the

following resolutions, which were unanimously adopted:

Resolved, That the hardware interests of the United States have sustained a great loss in the death of the Hon. Oakes Ames, who for nearly half a century has been looked up to as their prominent representative, and who has done more than any other man to advance the prosperity of this great branch of our national industry; therefore

Resolved, That in the death of Mr. Ames the hardware trade loses one of its most active and efficient members, the manufacturing interest its most able champion and advocate, and the country one of those great minds whose grasp was not trammelled by the cares of trade, but labored zealously and efficiently for the promotion of all great commercial interests.

Resolved, That, as a manufacturer and as a merchant, Mr. Ames has endeavored himself to all with whom he has been associated by his integrity; his genial, sympathetic nature; his intelligence; and his admitted eminent business ability.

Resolved, That, as fellow mourners, we sympathize sincerely with the family of our lamented friend in their great bereavement.

Resolved, That an authenticated copy of the proceedings of this meeting be forwarded to the family of Mr. Ames.

Mr. Ames' funeral was very largely attended by prominent public men, as well as many members of the Hardware and Metal trades, among whom we have heard the names of Abbott & Howard, John J. May, Benjamin Callender, A. J. Johnson, and Peter Butler, of Boston, and Richard Patrick, and George H. Sargent, of New York. The eminence of Mr. Ames as an extensive manufacturer of world-renowned goods is universally admitted, but the method in which the business of his house has been done has long been unpopular with the jobbing trade, and this feeling finds expression in the following communication.

To the Editor of The Iron Age:—We have no objection, as old hardware dealers, to indorse in part, the above resolutions, and we respect the memory of a man who, in his early days, was mechanic, and having learned the business his father—Oliver Ames—established more than half a century ago, sustained the good world-wide reputation of his productions of shovels and spades. Further, we respect his memory for worthy private charities and aid given by him in many local business enterprises, but we object to the first part of the preamble, viz.: The hardware interest of the United States have sustained a great loss. What loss have they sustained by the decease of a man who has ever refused to protect their interests? What has he ever done to endear his memory to jobbers of American hardware? As far as we know, other manufacturers fix, from time to time, the prices at which they will receive and execute orders for their productions. These are executed in turn in full in the order of their dates. The practice of Oakes Ames has been: First, To give no protection to the jobbers as against their own sales to small dealers. Second, To fill orders wholly or in part, as favoritism or self-interest dictated. Third, To fill orders at such times as best suited their pleasure. Fourth, To fill orders wholly or in part, in case of advance only at the advanced prices. Oakes Ames and another, now deceased, have done more to dry up the hard earnings of hardware jobbers than all the other hardware manufacturers in the country.

During all our business lives we have used our capital, and—because we must have the goods to make up our full assortment—carried Ames' shovels and spades, lost the use of our money in selling the goods for less than current store expenses, for the reason that any dealer or consumer in the country with \$50 in money or its equivalent in credit could buy direct as cheaply as the jobbers who sold them by the thousands of dozens. Dealing in these goods may seem the voluntary act of the jobber, but this is not the case, for all large dealers in general hardware must keep them for sale, and the more extensive the trade is, or the larger number of commercial travelers they have on the road soliciting orders, the greater will be their losses when an advance takes place in the manufacturers' prices. The memory of one such man as Henry Dietz is well dearer to hardware dealers than a thousand such men as Oakes Ames, who have refused to protect us against their own sales to retail dealers and consumers.

SHOVELS & SPADES.

The manufacturers of Tacks and Brads have issued a revised list and discount sheet. We publish herewith that portion of the list which has been changed. In the revised list it will be observed that Gimp and Copper Tacks, 1 to 8 oz., and Patent and Common Brads, 1/2 to 2 inch, are now sold in bulk, formerly only in thousands and half weights. The new scale of discounts are given below:

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

	6	8	10	12	14	16	18	20
New list.....	10	11	12	13	14	15	16	17
Old list.....	9	10	11	12	13	14	15	16

In order to effect the consummation of all pending business, the Board of Directors have decided to call a meeting of the shareholders for the purpose of electing a new Board of Directors, and for the purpose of amending the Constitution of the Company. The meeting will be held at the office of the Secretary, on Wednesday, the 15th inst., at 10 o'clock A.M. The Board of Directors have also decided to call a meeting of the shareholders for the purpose of electing a new Board of Directors, and for the purpose of amending the Constitution of the Company. The meeting will be held at the office of the Secretary, on Wednesday, the 15th inst., at 10 o'clock A.M.

The Pittsburgh Commercial, May 10, says: Business in all descriptions of raw iron continues light in the extreme. Manufacturers of Merchant Iron are very conservative in their operations, and rigidly restrict their purchases of raw stock to the weekly wants. There is no essential change in the market for raw iron, as relates to prices or demand. Dullness continues the leading feature. Receipts continue fair. There is not the slightest semblance of a speculative movement, and nothing but an increased consumptive demand can be looked for to impart buoyancy to the market. We are reported the following sales:

300 tons gray coal neutral	40 00-4 mos.
300 tons gray coal neutral	40 00-4 mos.
300 tons gray coal neutral	40 00-4 mos.
300 tons gray coal neutral	40 00-4 mos.
300 tons gray coal neutral	40 00-4 mos.
300 tons gray coal neutral	40 00-4 mos.
300 tons gray coal neutral	40 00-4 mos.
300 tons gray coal neutral	40 00-4 mos.
300 tons gray coal neutral	40 00-4 mos.
300 tons gray coal neutral	40 00-4 mos.

CINCINNATI.

Hanging Rock No. 1, 1/2 ton, 3500 lbs.	4 mos.
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"

BAITMORE.

1 to 6 wide by 1/2 to 1 thick.	4 mos.
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
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" " " " " " " "	"

LOUISVILLE.

1 to 6 wide by 1/2 to 1 thick.	4 mos.
" " " " " " " "	"
" " " " " " " "	"
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" " " " " " " "	"
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" " " " " " " "	"

CHICAGO.

1 to 6 wide by 1/2 to 1 thick.	4 mos.
" " " " " " " "	"
" " " " " " " "	"
" " " " " " " "	"
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" " " " " " " "	"

Consumers are all pining for the hand-to-mouth policy, but as they can possibly help, and for this there are several reasons: one is the continued unsatisfactory condition of the market for the product; another, the stringency in money matters, and still another, and fully as important, an expectation of lower prices. Quotations may be given as follows: No. 1 Foundry, 45 to 46; No. 2, 44 to 45; Gray Forge, 43 to 44; Cold Short, 42 to 43; Red Short, 41 to 42; Mottled, 40 to 41; White, 39 to 40. Charcoal Irons range all the way from 35 to 40 for hot and cold blast, according to quality. Blooms, 30 to 31, and very dull. The stock of Pig Iron in yard is unusually large for this season of the year, notwithstanding the receipts recently have been comparatively light, confirming what has already been noted, a very dull market. Trade in finished Irons is also unsatisfactory, and, as noted in my last letter, while the demand is comparatively light, there seems to be as much, if not more, complaint in regard to low prices than a scarcity of orders. It is said, and there is reason to believe that it is true, that orders have been, and are still being, booked considerably under the card, and even below what has been understood to be the selling price. 4-9-10 is the nominal card rate; 4 cents has been regarded as the selling price, but sales are reported at 3-7-10, notwithstanding it is said that there is no margin at these latter prices. Nails are also being looked away down under the card. In a word, it looks as if makers were working independent of each other. Hence, for the time being, the card has virtually been discarded. The steel trade continues quiet, although the mills are all running, and some of them report that they are pretty well sold ahead. No change in prices. The Window Glass trade continues dull, and as stocks are larger than usual at this season of the year, and some holders are anxious to realize, prices are being offered, are still tending in buyers' favor. Sales are being made—that is, for round lots—at 60 and 5, and even 60 and 10, on January list. The demand for hardware, both heavy and light, like everything else, is limited, and prices are unsettled and generally reported unsatisfactory.

FOREIGN.

Great Britain. Messrs. J. Berger & Co., London, Glasgow and Manchester, under date of April 25, 1873, report: Metals.—There is a fair amount of business now taking place in this market, and although individual transactions are small, still the aggregate makes about 100 tons a day. There is a fair amount of business now taking place in this market, and although individual transactions are small, still the aggregate makes about 100 tons a day. There is a fair amount of business now taking place in this market, and although individual transactions are small, still the aggregate makes about 100 tons a day.

Germany. (Borussia.) HAMBURG, April 25, 1873.—According to accounts just received from the Borsig locomotive works, the completion of the three thousandth locomotive by the establishment was duly celebrated by the owner, Mr. Albert Borsig, and his men. Mr. Borsig added another 10,000 thalers on the occasion to the 10,000 thaler invalid fund created by him, and the presents were made to the workmen, according to the length of time during which each had served the concern. Mr. Borsig wound up the festivities by an address to his workmen, in which he stated that his establishment was now in a position to convert the work into a share company, and thus withdraw from the annoyance which discussions of the labor agitation had recently caused him to apprehend. The fact and moderation displayed by his men had been heartily appreciated by him, and he held through this very circumstance of a good understanding between employer and men.

Belgium. (Frankfurter Zeitung.) CHARLEROI, April 14, 1873.—Business in iron has been of a dragging nature during the week. Orders for rails have been received from the United States, but the limits are too low, and it is doubtful whether they can be filled. The parties entrusted with these American orders have been endeavoring to execute them, but in vain, and the consequence has been that they have not been able to do so. The holiday has produced dullness in the coal market, but prices are firm and unchanged.

France. (Revue Industrielle.) CHARLEROI, April 25, 1873.—It will be remembered that the price of Pig Iron had been fixed by the works at 33 francs, but of no avail, for immediately subsequent to this enhanced tariff of our iron masters manufacturers by common consent refused to buy even at 32. Business thus came to a complete standstill. Some of the works with good stock on hand at this juncture preferred to withdraw from the compact, and began to sell at 31, and even 30 francs, and we are told that manufacturers are willing to go on at this figure. Other works have adopted a different policy since the outbreak of curtailing production. Thus, notwithstanding the fact that the price of Pig Iron has been fixed at 33 francs, they have been making iron for building purposes, and have been better sustained. Wrought iron has ranged between 28 and 40 francs, with sales during the week at 28. Plasterers command 34 to 35 francs. Beams, notwithstanding a good inquiry, have gone at 23. The position of our rolling mills has been aggravated by the state of affairs in Germany. Contracts had been made to deliver large amounts of iron at the time when prices were at their highest point, and the closest scrutiny has been used by the buyers when delivery came to be made, some 4000 tons being rejected. The same complaint comes to us from the North of France, whose rolling mills have been paralyzed. Consumers buy nothing, despite the concessions that have been made by some establishments. Rolling mills decline to go on; they prefer to wait, and it is useless to force the raw material into their hands. Drooping figures. Values, it will thus be perceived, are unaltered, yet nobody seriously apprehends a crisis in the iron trade—except those who are eager to meet their customers upon a greatly reduced basis of values.

CHILI. (Private Telegram.) VALPARAISO, April 15, 1873.—Copper, in bars, on board, 439.50 per quintal. Charters for Europe since last mail, 2100 tons.

EAST INDIES.

(Ernst & Oesterley's Telegram.) CALCUTTA, April 29, 1873.—English Tin Copper 35 rupees; real Silesian Spelter, 10-12; good hard quality, 7-8. Freight falling. Exchange weak at 1/11 3/4 to 1/11 1/4.

POINT DE GALLE (Ceylon), April 3, 1873.

Operations on American account have kept prices rather high, but only for prime qualities; inferior ones are neglected and almost unobtainable at any price. Admixtures at the mines is becoming too prevalent. We quote, free on board, with exchange at par: Lamp, 27.10 to 28.10 per ton; Chips, 24.10 to 27.10, and Dust, 27.10 to 28.10. Select qualities in request. Freight.—The Express has been taken up for New York, for which destination the Thornton has about completed loading. The Mercia is busy taking in 200 tons, assorted cargo, and will fill up here, and the High Bourne, after taking 100 tons do., will proceed to Alleppey to complete. Both will probably sail this week. The Lochan has been chartered, 360 tons capacity, to proceed from Chittagong to Ceylon, and thence to New York, on secret terms. Exchange has gone against exporters. Credits, 1/2 per cent. premium to par, and documents 1 to 1 1/2 per cent. discount.

Bombay, April 1, 1873.—Metals.—Iron is in active demand. Copper and Yellow Metal, Braziers, are quiet. Of Iron Hoops, 1000 bundles realized 8 1/2 rupees per cwt. We note sales of Copper, Braziers, at 55-2 to 55-4 rupees per cwt. Yellow Metal, Braziers, at 44-2 per cwt. Of Steel, in faggots, 1000 bundles sold at 9-2 rupees per cwt. Coal.—Rates are well maintained. There are only 6000 tons at present in first hands. We quote: West Hartley, 26 rupees per ton; Welsh Hartley, 25; Scotch, 24; Cardiff, 26; Australian, 24; and Smythly coal, 30. The market closes very firm. Freight, for New York and Boston, 24-10, has been offered for a first-class ship of 1300 tons. Unfixed tonnage in port, 7933 tons; fixed, 44,445. Exchange—6 months on London, 1/11 7/16 to 1/11 23/32.

BRAZILS.

(Henry Foster & Co., through H. H. Swift & Co., New York.)

Pernambuco, April 9, 1873.—Business in general, and in Metals in particular, has been rather quiet, owing to the heavy showers hampering the forwarding of goods inland. The following are the partially nominal quotations: Lead, Shot, 24,000 to 28,000 reals per quintal; Tin, 30,000 to 32,000 reals per box; Copper, 8000 to 9000; do. Sheet, nominal. Coal.—We have to advise the arrival of two cargoes of, together, 737 tons for our gas works. No sales have transpired in the market, and we nominally quote 36-00 to 36-20 per ton. Exchange on London, 98 days' sight, 26 1/2 d. to 27 1/2 d. per mil.

IMPORTATIONS.

Of Hardware, Iron, Steel and Metals into the Port of New York, for the week ending May 13, 1873:

Hardware.	Scrap, tons, 888; lbs., 1800
Fence, Eyde & Co.	Rails, 547
Arms, cases, 3	Bars, 1167
Field A. & Co.	Bags, 319
Misc. pkgs., 4	R. tons, 1100
Hilger & Sons,	Fish plates, bbls, 325
Case, 3	
Milliken S. Jr.,	Steel.
Wire, bbls, 762	Naylor & Co.
Moore's J. P. Sons,	Misc. pkgs., 50
Arms, cases, 5	Prosser Thos. & Son,
Case, 312	Bags, 319
Wire rods, coils, 1193	Slag Joseph.
Ranf R.	Misc. pkgs., 215
Screws, cs., 10	Van Wart & McCoy,
Schroeder & Daly,	Misc. pkgs., 250
Case, 312	
Windmiller L. & Roelker,	Rails, 3510
Arms, cases, 18	Bessemer rails, 70
Order.	
Wire rods, bbls., 302	
Nails, kegs, 28	
	Metals.
Congreve Chas. & Son,	Bank of British North America,
Fish plates, bbls, 1670	Tin slabs, 1055
Douglas Jas.	Baring Bros. & Co.
Scrap, tons, 7	Tin slabs, 1055
Henderson	Brown Bros. & Co.
Pigs, tons, 150	Tin slabs, 1045
Hopkins H. & J.	Dickerson & S. & Co.
Bundler, 329	Zinc, cks., 80
Holden, Hopkins &	Old brass, lbs., 3100
Stokes,	Old lead, lbs., 132
Bundler, 329	Fence, Eyde & Co.
Jarvis Geo. E.	Lead, pigs, 964
Rails, 547	Figueras J.
Oothout Wm.	Lead, pigs, 710
Bars, 289	Lamarche H.
Osborn J. & Son,	Zinc, cks., 15
Scrap, tons, 6	Phelps Dodge & Co.
Smith G. & Co.	Tin plates, bxs., 2922
Old rails, pcs., 601	Misc. cks., 17
Salomon A. H. & Co.	Zinc, cks., 130; bbls., 260
Scrap, tons, 35 1/2	Order.
Tucker & Lightbourne,	Zinc, pigs, 2549;
Scrap, tons, 6	plates, 10,038
Whitney A. R.	Copper, pkgs., 661;
Bars, 1600	pigs, 1717
Order	Lead, cks., 817; pigs, 4293
Old rails, tons, 297	Scrap brass, cks., 3
	Tin plates, bxs., 5894
	Tin ingots, 180
	Antimony, cks., 16

Miners' Strike.—About a month ago the miners of iron ore on Lake Champlain made a demand for three dollars per day of ten hours, or two and one-half dollars per day of eight hours labor. At a recent meeting of the "Union" miners, at Port Henry, it was resolved to work out this week, and unless their demand was conceded they would not go to work on Monday. The price paid during the winter was \$2-20, therefore the demand for 30 per cent. advance. There are now more than 3000 miners at work in the various mines at Port Henry and along the Saranac and Ausable Rivers, and if the advance the miners demand is conceded there will be "flush times" and less work done, as high wages demoralize labor. As nearly five tons of the lean or 50 per cent. ore are consumed per ton of iron made, the margin of profits on iron will be considerably lessened if the strike is successful.

Our English Letter.

Review of the British Iron, Steel, Coal and Hardware Trades.

(From our Regular Correspondent.)

SHEFFIELD, Eng., April 23, 1873. At the very outset I must warn such of your readers as shall favor me with a perusal this week, that my effusion will be little better than a mass of statistics, and that, therefore, although I do not lay any claim to be entitled a man of figures (as does Mr. Mundella, member for Sheffield), I am, figuratively speaking, for the nonce a mere mouthpiece for some of the various contentions of which our nine numerals are capable. The iron trade appears to be in a steady condition, with little tendency to

Table Showing the Production, Importation, and Consumption of Iron and Steel Rails in the United States in 1872 and Preceding Years; also the Average Price Per Ton and the Number of Miles of Railroad Built in each Year.

From the Bulletin of the American Iron and Steel Association.

Years.	Total Rails made in U. S. Tons of 2000 lbs.	Total Rails Imported Tons of 2000 lbs.	Total Consumption of Iron and Steel Rails Tons of 2000 lbs.	Average Price per ton of 2240 lbs. of American Iron Rails.	Average Price of British Steel Rails from 1864 to 1872, in gold.	Average Price of American Steel Rails from 1867 to 1872, in currency.	Average Price of Gold from 1869 to 1872.	Number of Miles of Railroad built in U. S. in each year.
1840.....	24,815	60,163	93,481	\$ 53%	.....	.....	100	1,369
1850.....	44,093	139,050	203,163	47%	.....	.....	100	1,626
1861.....	50,603	226,850	276,933	45%	.....	.....	100	1,961
1862.....	62,478	294,750	357,228	48%	.....	.....	100	1,925
1863.....	81,264	336,794	446,638	71%	.....	.....	100	2,430
1864.....	108,016	339,459	447,465	80%	.....	.....	100	1,860
1865.....	128,674	153,019	291,693	63%	.....	.....	100	1,654
1866.....	120,013	126,594	246,612	64%	.....	.....	100	2,643
1867.....	161,919	215,106	377,094	64%	.....	.....	100	2,491
1868.....	163,712	90,894	254,606	50	.....	.....	100	2,460
1869.....	195,454	83,968	379,413	49%	.....	.....	100	1,891
1870.....	205,039	146,610	351,649	48	.....	.....	100	1,846
1871.....	187,516	80,388	277,306	48%	.....	.....	100	621
1872.....	213,913	10,186	224,098	41%	.....	.....	113	864
1863.....	275,768	20,506	296,274	76%	.....	.....	145	1,030
1864.....	335,360	143,457	477,226	126	\$140	.....	202	1,598
1865.....	356,399	63,297	419,619	98%	120	.....	157	1,877
1866.....	420,776	117,778	538,656	86%	120	.....	140	1,892
1867.....	462,108	184,840	646,948	83%	118	\$160	138	2,227
1868.....	506,714	300,160	806,874	78%	104	158%	140	3,063
1869.....	593,586	336,500	930,086	77%	90	123%	136	4,977
1870.....	620,000	472,403	1,092,403	73%	87%	106%	115	6,145
1871.....	775,783	573,356	1,349,119	70%	97%	103%	112	7,453
1872.....	941,992	830,850	1,472,542	88%	108	113	113	6,043
1873.....	.....	.....	.....	89	115	120	.....	.....

change, and that, if anything, upward. In the Birmingham and Wolverhampton district a good trade is doing in imitations of American axes, the copying being reported to be so successfully done that your makers are being run hard as to prices and in other respects. The demand from the United States for finished iron is still much below the average, and no great amount is doing on Canadian account. There is a brisk inquiry for hammers, iron tubes, fittings and heavy iron foundry produce. There is an active trade doing in light malleable castings, in all kinds of chandeliers and gas fittings, and in hollow wares, both cast and wrought. Railway wagon and carriage builders are busy, as also are machinists and the whole of the engineering establishments. German silver has gone up from a penny to three pence per pound, on account of the scarcity of nickel, and common iron wire has gone up 6d. per bundle, or 41 per ton. The tin plate trade is quiet, but Japanese lockmakers, screw manufacturers, and others are fully engaged. The leading South Staffordshire firms are well supplied with orders, and current prices are: cinder pigs, 25. 10; average pig, 27. 10; all-mine native, 28; common bars, 24; medium, 25; best, 26; Earl Dudley's, 26. 12 6; ordinary sheets, 219 to 221; doubles, 223; latins, 224; boiler plates, 219; hoops, 216 to 217; and steel strip, 216. 10 to 217. 10. In Lancashire business is fairly brisk with the following current rates: No. 3 foundry pig, 28. 5; bars, 24 to 24. 10; hoops, 24. 10; plates, 24 to 24. 10; and sheets, 24. 10 to 24. 10. In South and West Yorkshire the ironworks are quite as busy as heretofore, and the remark applies with equal truth to the Sheffield Steel Works. The forges and mills are all well employed, and no foundry lacks work. A large tonnage of Bessemer rails is being turned out, as also Bessemer steel in blooms. All kinds of railroad iron are in request. The engineering works were hardly ever busier at any time. Low Moor and Bowling, both famous for their tough Yorkshire iron boiler plates and other descriptions, are full of work, and their prices appear to have been in effect on the demand. At Sheffield I hear of rather improved prospects in the cutlery trade, some good spring orders from the United States having just come into the factors' hands. These are being got up as rapidly as is possible, and will, if supplemented without delay by others of good calibre, be of considerable service to the smaller cutlery manufacturers, some of whom had begun to be somewhat apprehensive for the immediate future of the trade. Fair inquiries have also been placed through the medium of Wolverhampton, Birmingham, and London factors, cutlery and edge tools being usually bought by them. In the Cleveland district quotations are fully maintained. No. 1 pig is 28. 5 to 28. 7 6; No. 3, 25. 18 to 26, and No. 4, 25. 15 to 25. 17. There is a great demand for forge iron, but it cannot at present be fully appeased. Rails are 213; plates, 214. 10; common bars, 213. 10, and puddled bars, 25. 5 to 29. 10. Scotch quotations have improved, warrants being now at an average of 119. Makers' figures are a trifle better than those given last week. Shipments are again less, as will be seen by a glance at the statement hereinafter given. In Wales the work is quiet, mostly on full time. It is rumored that Mr. Crawshaw is negotiating for the sale of Cyfarthfa works, the price not being under, but over, one million pounds. This, I suppose, one result of the late strike. If it should be formed into a limited liability company, no doubt Mr. Crawshaw, Jr., and Captain Ralston would figure prominently among the list of directors. The house coal colliers met at Pontypridd, on Friday, and resolved to ask for another advance of wages at once. Here as elsewhere the price of coals has fallen considerably during the past week or two, partly owing to the increased output, partly owing to the decreased demand for house coal consequent upon warmer weather, and partly owing to the severe economies now becoming general throughout the country. Nobody buys more coal than he wants now-a-days, whereas under the old prices he would have been totally indifferent whether he had much, provided he had not too little.

The coal committee has resumed its sittings, but as yet I fail to see that the country at large is much the wiser for the evidence given before it. As the matter is of vital importance here, and in a less degree, on your side of the Atlantic, I submit the substance of what was done at this stage.

Mr. Hylop, assistant inspector to his father in North Wales, gave statistics of the number of collieries and quantity of coal produced in his district. His father inspected 192 collieries now, compared with 126 in 1871, and there were several new collieries about to be opened. The increase in the number of persons employed was from 30,000 in 1868, to 32,218 in 1871, and 34,000 in last year. The quantity of coal raised

in the same period had risen from 27,700 tons to 3,000,000 tons, and the number of tons per person from 137 to 264. The class produced was chiefly used in the cotton manufactures in Lancashire. The importation into Lancashire from other districts had nearly ceased, and consequently there had been a greater demand on the Welsh collieries. There had been a rise of 75 per cent. of coal at the pit's mouth, which he attributed to the excessive demand. It might be that the men had not turned out the same quantity.

Mr. Alexander, inspector of the West District of Scotland, including Ayrshire, Dumbartonshire, and other counties, said he had 210 collieries under his inspection, as compared with 203 in 1868 and 196 in 1871. The output per colliery ranged from 30,000 to 300,000 tons, or 3,000,000 tons annually.

The Chairman: Can you state the cause of the increase in price?

Witness: I attribute it principally to the improvement in trade, especially the manufacture of pig iron.

Mr. Stanhope: Have there been any steps taken by the men to diminish the amount of production?

Witness: I do not think much. Wages have risen from 4/3 to 7/6, though the latter is not the exact earning, but is the understood wage. There have been many new pits opened lately.

Do you look for any increase in the supply in the next few years in consequence of the increase in the price of coal? I do not think the price will continue long, and I think the increase in the production will stop soon after the decrease in price. There has been an increase in the demand for coal for shipping on the Clyde. There is one coal-cutting machine employed in the district, worked by compressed air (at Garthferrie works).

Mr. Moore, inspector of collieries in part of Lanarkshire, part of Stirlingshire, Fifeshire, and the Lothians, stated that there were five collieries producing more than 300,000; eight, over 200,000; six, over 100,000; eight, over 110,000; fourteen, over 80,000; and seventeen, 6000. Iron-ore prices were continuing to rise, and were also carried on in the district. The number of collieries after 210 in 1867 and two following years, and 220 in 1870 and two following years. The quantity of coals raised had risen from 7,897,368 in 1868 to 8,823,926 in 1871, and 9,046,814 tons in 1872. The output per man, was 272 tons in 1867; 307, in 1868; 303, in 1869; 314, in 1870; 324, in 1871; and 301, in 1872. The men do not work so much time now as they used to do. They do not work so many hours, and they do not work so many hours. I think the increase in price is due partly to the railways being unable to supply the demand. In January, 1872, wages were 6/ per day. Best time from June to October wages rose to 10/ per day, 2/2 per ton was paid in January, and upward of 3/ in October. This is the actual working of a collier in 1872: He worked 212 days, was idle 102, and he got 624 tons for £70. 7s. The year before the same man got 791 tons for £52. 12s. 10d.

The Chairman: How much work can a man do without injury to his health? Can he work every day?

Witness: I think he can, eight hours a day. Considerable quantities of coal are used in iron melting and manufacturing, and considerable quantities are shipped to Germany and the Mediterranean. In January the price was 5/3; in June, 5/10; in September, 7/; in October, 11/8; in November, 12/.

The Chairman: And to what do you attribute this increase in the price of coal?

Witness: We have always had these rises in the prices almost every year. I have here a statement for 40 years. The same rise, though not to the same extent, has taken place every 10 years. In 1830, the price was 6/; and in 1840, 5/; in 1850, 7/6; in 1860, 9/; and in 1872, 12/.

The metal market has not been brisk during the week. Messrs. Vivian, Younger & Co., of Liverpool, in their circular, say "that business has not been active, and in some instances prices are easier. In Copper there has been a steady, though rather moderate, business in most branches of the trade, as foreign descriptions are 10/ per ton lower than at the date of our last circular. English in fair demand. In Tin transactions were unimportant until Tuesday last, when large "bear" operations were entered into, at continuously lower prices, thus depressing the value of Straits about £6 per ton for the week. The statistical position of the article remains unchanged, and the general opinion is that a corresponding reaction will set in later on, as is the usual result of such operations." Tin plates are firm at the late advance, owing to the activity of demand. For Spelter the demand is somewhat less brisk, but prices are fully maintained. Silesian, 237. 15 to 238; W. H., 229; Rhinish, 237. 10 to 238, both in London and output.

Crampton's Coal Dust Furnace.

The experiments made during the past two or three years to perfect the dust fuel furnace invented by Mr. T. R. Crampton, previously described in these columns, have been brought to a successful issue, and we learn from *Engineering* that it is now regularly at work in the Royal gun factory, at Woolwich, giving the most satisfactory results, and establishing an important economy. As our readers will remember, the principle of this furnace consists in the use of finely powdered coal, mixed with air, and delivered in several streams into the combustion chamber, and its success depends upon the perfect combination of the fuel and air at the point of combustion. The heat thus generated passes into a second chamber where it is utilized, the waste products of combustion passing away in the ordinary manner. The system is applied at Woolwich to a revolving puddling furnace, which is about 12 ft long and 7 ft. in diameter externally, and is carried at each end on a pair of bearing wheels. It is driven through toothed gearing by a small steam winch having a pair of 5 in. steam cylinders with 10 in. stroke, and it revolves with the greatest regularity and steadiness. The coal dust is ground very fine and is conveyed direct to the feeding apparatus at a cost of about 1/2 per ton. The feeding apparatus consists of a hopper, in which a couple of stirrers revolve, and deliver the fuel through an aperture on to a pair of horizontal rollers, between which it passes down a shoot placed over an opening in a horizontal tube, through which a current of air is blown by a fan. This causes an induced current at the point at which the fuel is delivered, and draws it into the furnace. The delivery of both fuel and air are nicely regulated, and can be varied as occasion may require. It is this part of the apparatus which has required the most careful consideration, and which has taxed the ingenuity of its inventor to the utmost to perfect. He has, however, succeeded in perfecting it, and in so regulating the streams of air and powdered fuel that a thorough remixing of them takes place, and those volumes of air which may be surcharged with fuel, are mixed with other volumes that may be undercharged. By these means the required equilibrium of the fuel charge is maintained, or when it happens to be temporarily disturbed it is properly restored, the result being that every particle of fuel is consumed, none being carried forward in the solid condition into the working chamber.

The Woolwich furnace is lined with a refractory material, and is divided midway of its length by a diaphragm of the same material, having an aperture for the flow of the heated gases from the combustion to the working chamber. The stream of fuel is injected at one end of the cylinder, whilst at the other the heated products of combustion pass off into an iron flue which is removable, and leads to the chimney stack. This flue-piece is lined with firebrick, and has a counterbalance weight attached to it, so that it is easily removed and replaced before and after the charging or drawing of the furnace. The iron casing of the furnace is double, and between the inner and outer skin a constant stream of water plays. It is admitted through a pipe carried through the center of the fuel-tube, and the heated water finds its way out by a similarly placed pipe. The water enters cold, and leaves the furnace casing at a temperature of about 80 deg. Fahr. The flue-piece is kept cool in a similar manner, the water, however, leaving it at a very low temperature. The arrangement for keeping a constant stream of water flowing over the whole surface of the furnace is very simple, and it keeps the outside absolutely cool. Hence there can be no distortion from contraction or expansion, the furnace has working with a minimum of destructive action, and with a very small expenditure of power. The proper complement of hands for working the furnace is a puddler and helper, and a man at the coal-grinding machine, with extra hands when the charge is being drawn from the furnace. The economy of working as regards the interior of the furnace is secured by giving the firebrick lining a protective covering of slag, which renews itself, and costs nothing. The fettling used is the mill-tap from the coil furnaces in the Royal gun factory, and which contains about 50 per cent. of iron. The work of fettling is a very simple operation, being rendered so mainly by the effectual cooling of the exterior surfaces of the furnace.

In working the furnace at Woolwich it is found that eight heats of 5 cwt. each can be got out in a 12 hours' shift, the iron being melted in the furnace itself. A cupola, however, has been erected, in which it is proposed to run down the cast scrap first, and deliver it into the puddling furnace in a molten condition. By this means Mr. Crampton anticipates working off eight or ten charges of 12 cwt. each in the same time.

The furnace runs very smoothly, and the exterior remains perfectly cool. The air and coal are kept intimately mixed during flotation, and perfect combustion is insured, so that there is no deposit of carbon either in the combustion or the working chamber, and no smoke. The yield of the furnace is found to be from 5 to 10 per cent. in excess of the charge, the surplus being of course due to the fettling used. The quality of the metal produced, too, compares well with that of iron made under the ordinary system, which, after being three times rolled, usually stands a tensile strain of about 22 tons per square inch. The puddled ball from the Crampton furnace, after being only once reheated and rolled, is found to stand a minimum strain of 23 tons, which frequently rises to 26 and 28 tons. Some samples of this same iron, after being hardened, gave strains of 39 and 46 tons to the inch, the metal being of very high quality.

Although the system has only at present been applied to a puddling furnace, its use is by no means limited to furnaces of that description.

It is equally applicable to the furnaces of steam boilers and reverberating furnaces. In the earlier stages of the invention it was, in fact, applied to the furnace of a steam boiler, and during a 24 hours' trial the temperature of the gases in the smokebox were found never to vary more than 20 deg., or from 380 to 400 deg. This power of equal combustion is of the utmost importance for superheating steam, which is at present of doubtful practical advantage, in consequence of the uncertain heats to which superheating apparatus is exposed. Mr. Crampton has unquestionably succeeded in effecting that which has never been effected before, viz.: the employment of streams of air and powdered fuel, not only with great regularity and efficiency, and without smoke, but also with the requisite economy for the heating of furnaces of any ordinary construction.

The Iron Interests of Virginia.

The Richmond, Va., *State Journal* takes a hopeful view of the prospects of iron manufacture in that State. We quote as follows:

As early as 1617, on the arrival in Virginia of Captain Argall, as governor, an effort was made by him to get "men skilled in iron works," "men skilled in mines," and in the "making of edge-tools," into the colony. Not long afterward, a writer on the material resources of the colony expatiated upon the iron of Virginia as follows: "Neither does Virginia yield to any other province whatever in the excellency and beauty of this ore; and I cannot promise to myself any other than extraordinary success and gain, if this noble and useful staple be but vigorously followed." And yet in 1705, almost a hundred years afterward, Beverley, in his history of Virginia, complains of the dependence of the colony upon other nations to supply their wants in iron and in almost all other manufactured articles. He says, in speaking of the colony in this respect: "Nay, they are such abominable ill-husbands, that though their country be overrun with wood, yet they have all their wooden-ware from England; their cabinets, chairs, tables, stools, chests, boxes, cart-wheels, and all other things, even so much as their bowls and birchen brooms—to the eternal reproach of their laziness."

Now, we would not be as hard as this on the good people of the Old Dominion in that early day. Between the years 1617 and 1705, certain causes intervened to change the policy of our people in respect to their material industries. A system of labor had been introduced into the colony, and generally adopted, which rendered manufacturing and commercial enterprise less desirable for the wealthy planter than the cultivation of the chief staples exported by the colony. It was not so much the fault of Virginians as of this system of labor fastened upon them by the greed of the "mother country," aided by the aristocratic and titled governors who came out here to share in the general profit. Had Virginia not been cursed by African slavery thus early in her history, she would have been among the foremost States of the Union to-day, in all the material industries which now promise so glorious a future for her in the swiftly coming decades.

In her great iron interest she is rapidly advancing, and the time is not distant when she will lead, with a few other States, in the production of this great product of national wealth and power. There are now scarcely less than 40 blast furnaces in operation in the State, beside a large number of iron properties which have been purchased with a view to erecting other furnaces. In fact, the number of furnaces in contemplation is probably larger than that in actual operation. Beside these, there are about 30 forges, rolling-mills, and foundries in the state, there being 12 or 13 in this city, including the Tredegar and Old Dominion Works; and it is safe to say that our iron interest is more active and growing at the present time than any other material industry in the State.

This is certainly encouraging, and the most encouraging part of it all is, that many Virginians, aided by Northern capital, are pulling off their coats, rolling up their sleeves, and pitching into our iron mountains, to develop this source of material wealth and power to the State.

Ventilation of Mines.—This important subject was animatedly discussed at a meeting of the Scientific and Mechanical Society, at Manchester, which was evoked by a paper with this title, by Mr. Hacking. The defects of ventilating by means of rarifying furnaces were pointed out. Exhaust fans were said to be found uncertain, on account of the wear and tear; and the liability to breakage and stoppage, and steam jets—as they had hitherto been applied—were admitted to be a failure. It is, however, a fact worth knowing, that the steam jet has lately been very successfully applied by Mr. G. L. Scott, of Gorton, to a mine in Wales. Unlike previous attempts, the jets have, in this instance, been placed on the surface, sideways to the upcast shaft, the mouth of which is sealed. A number of plain cast iron cylinders are placed in an upright position, with a steam jet applied at or near the bottom of each, steam being supplied by two boilers, one of which is kept in reserve. Here we have the whole apparatus on the surface, moving parts being entirely absent, and the danger of an underground furnace avoided also. The arrangement is said to be quite a success.

The Marquette (Mich.) *Mining Journal* says: A new blast furnace is nearly completed at Elk Rapids, in the Grand Traverse region. It will have a capacity for about 25 tons a day, running on charcoal fuel and Lake Superior ores. We know of no region of country that presents more inducements for the manufacture of charcoal pig iron than the counties bordering on the east shore of Lake Michigan.

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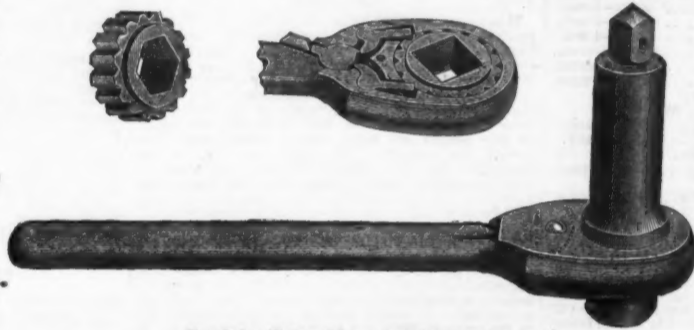
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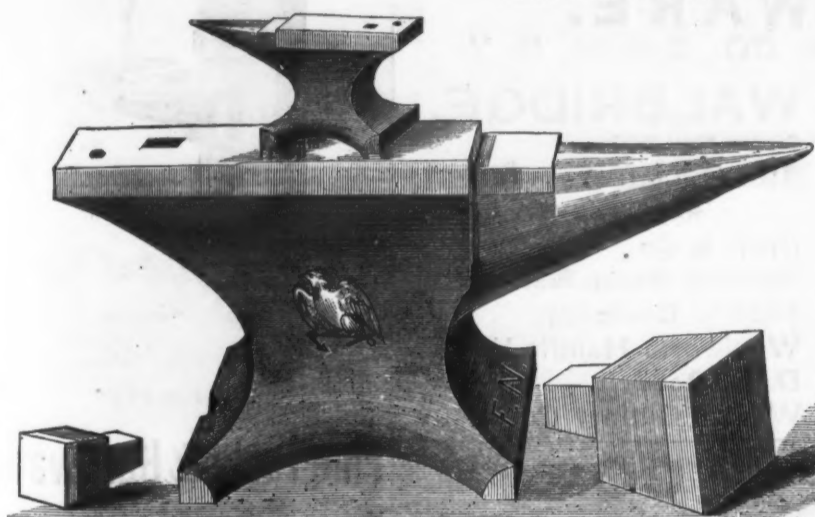
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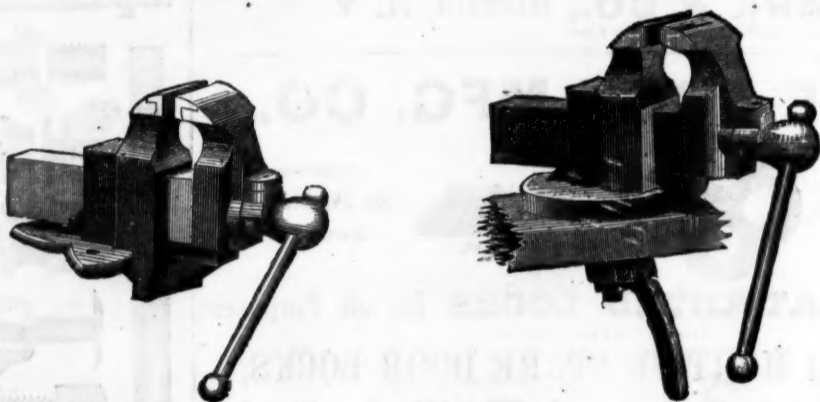
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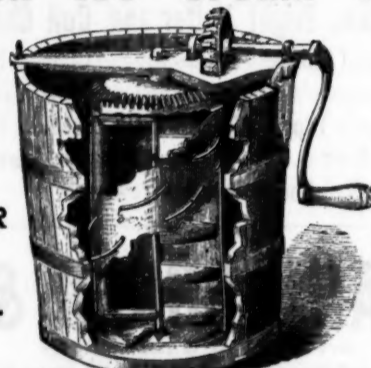
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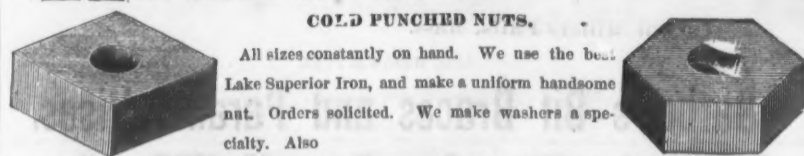
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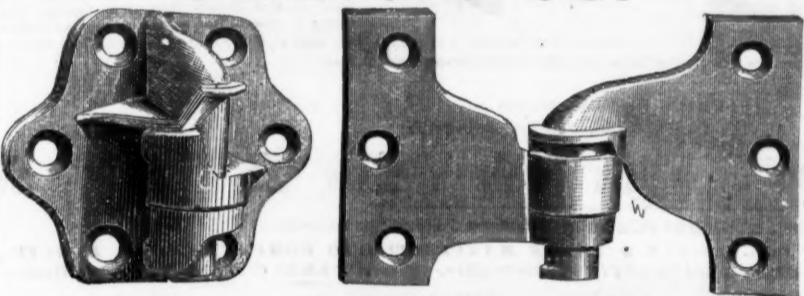
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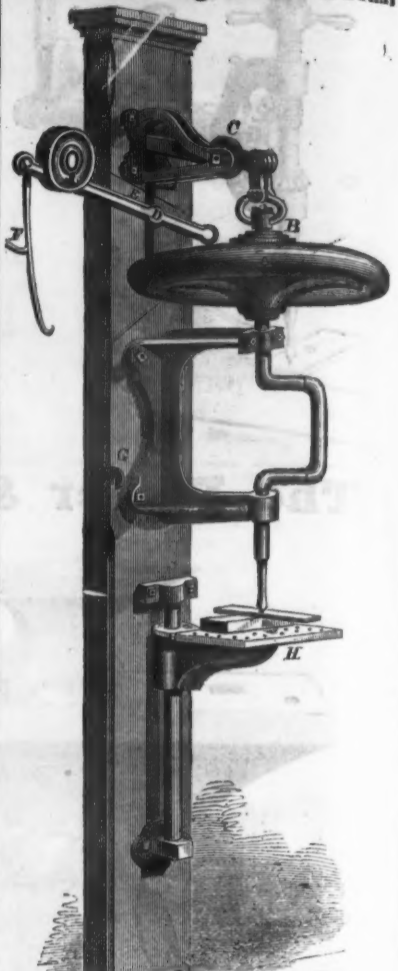
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Rose Pink	1 1/2 @ 30c
Sienna, American, raw	1 1/2 @ 30c
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" in oil	1 1/2 @ 30c
" Raw	1 1/2 @ 30c
" in oil	1 1/2 @ 30c
" Umber, Burnt	1 1/2 @ 30c
" in oil	1 1/2 @ 30c
" Raw	1 1/2 @ 30c
" in oil	1 1/2 @ 30c
Vermilion, Chinese	1 1/2 @ 30c
" English	1 1/2 @ 30c
" Trieste	1 1/2 @ 30c
" American, Common	1 1/2 @ 30c
White Lead, American, pure dry	1 1/2 @ 30c
" in oil	1 1/2 @ 30c
White, Paris, English, prime	1 1/2 @ 30c
Yellow Ochre, French	1 1/2 @ 30c
" in oil	1 1/2 @ 30c
" Vermont	1 1/2 @ 30c
" in oil	1 1/2 @ 30c
" Chrome	1 1/2 @ 30c
" in oil	1 1/2 @ 30c
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Glass, White	30c @ 45c
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Glaziers' Points, Zinc	30c @ 45c
Gum, Copal	25c @ 30c
" Damar	25c @ 30c
" Shellac, English	25c @ 30c
Litharge	10c
Pumice Stone, selected Lump	4c @ 6c
" powdered	4c @ 6c
Patty in bladders	30c @ 45c
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18 x 22	13.25	12.00	10.75	9.50
15 x 26 to 20 x 30	15.25	14.00	12.50	10.25
22 x 30 to 24 x 36	19.25	16.75	15.50	13.50
26 x 36 to 28 x 42	23.25	20.75	18.50	16.50
30 x 36 to 32 x 42	27.25	24.75	21.50	19.50
34 x 42 to 36 x 48	31.25	28.75	25.50	23.50
38 x 48 to 40 x 54	35.25	32.75	29.50	27.50
42 x 54 to 44 x 60	39.25	36.75	33.50	31.50
46 x 60 to 48 x 66	43.25	40.75	37.50	35.50

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SIZES.	I.	II.	III.	IV.
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10 x 16 to 14 x 20	17.25	15.50	14.75	13.25
18 x 22	18.25	16.50	15.50	14.25
15 x 26 to 20 x 30	20.25	18.00	16.25	14.25
22 x 30 to 24 x 36	24.25	21.00	19.25	17.00
26 x 36 to 28 x 42	28.25	24.50	22.25	20.00
30 x 36 to 32 x 42	32.25	28.50	26.25	24.00
34 x 42 to 36 x 48	36.25	32.50	30.25	28.00
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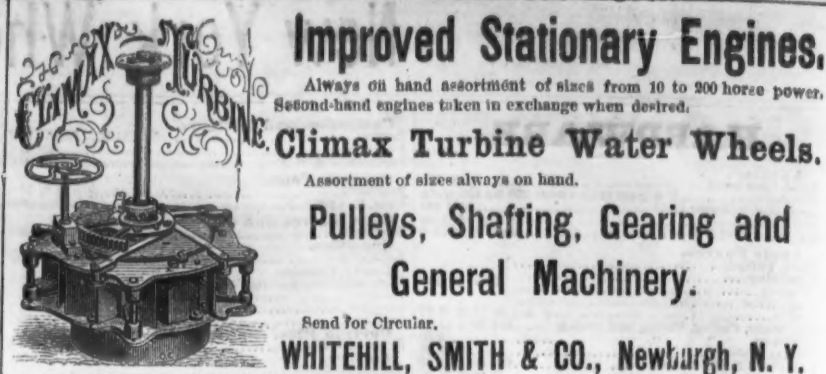
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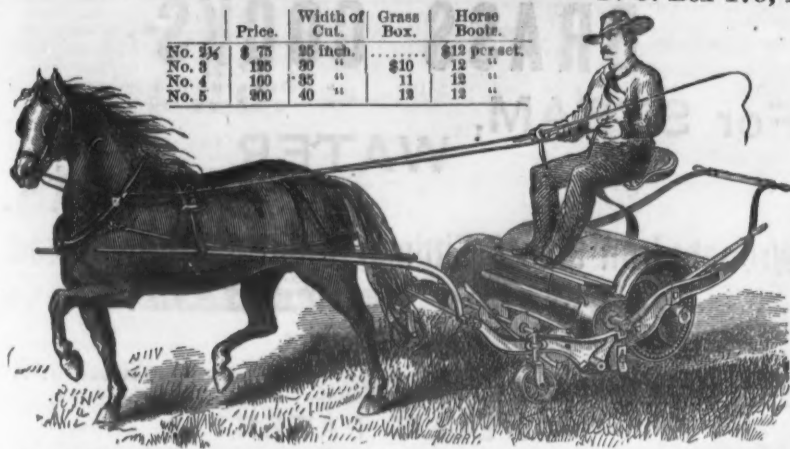
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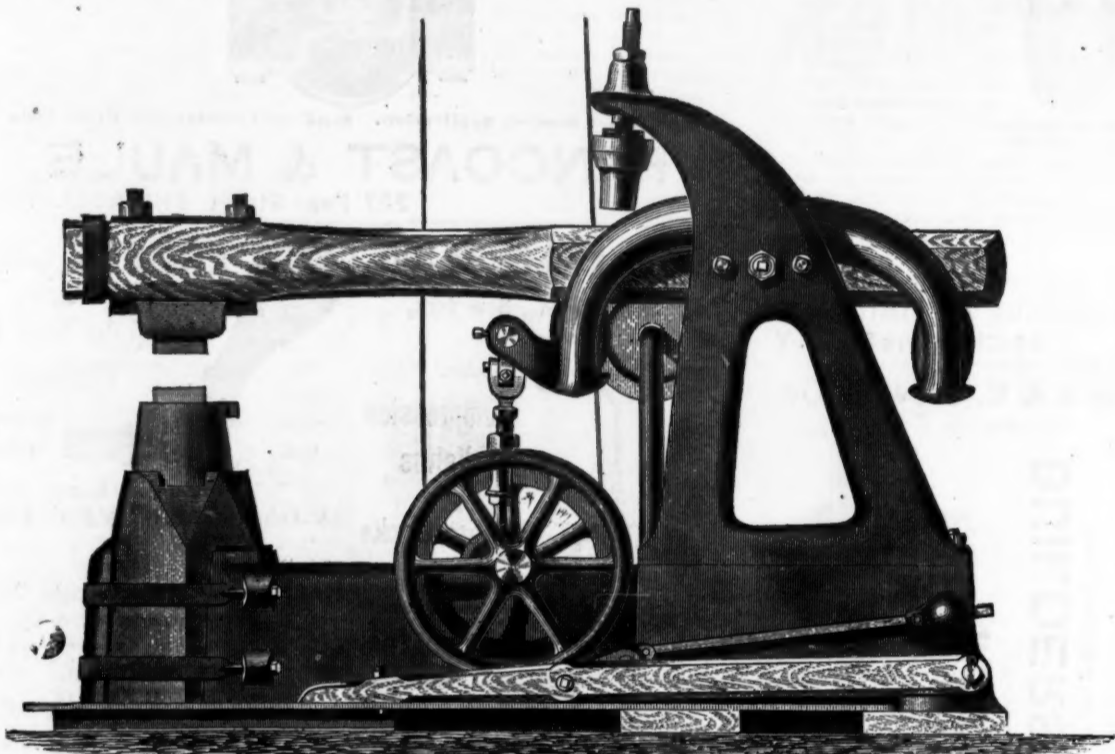
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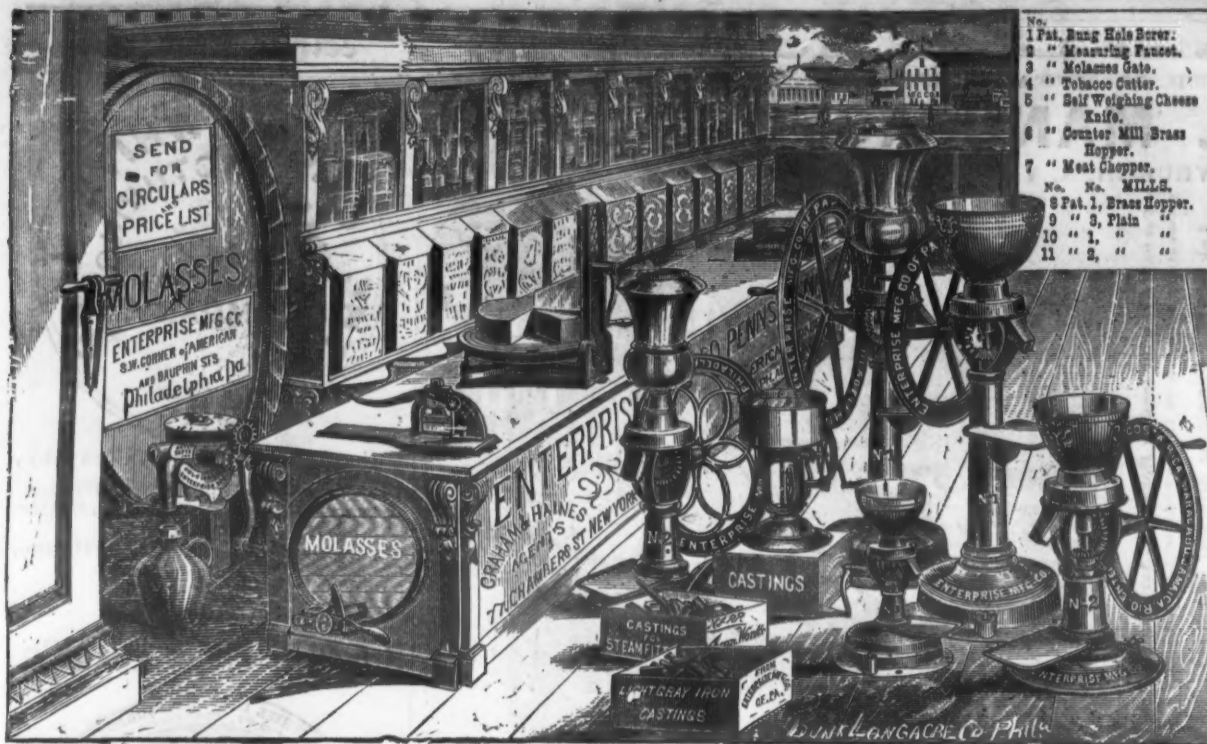
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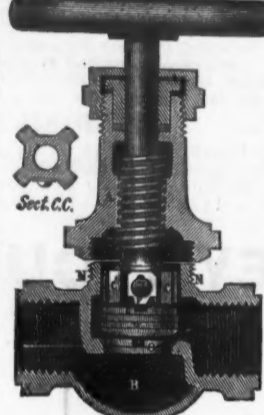
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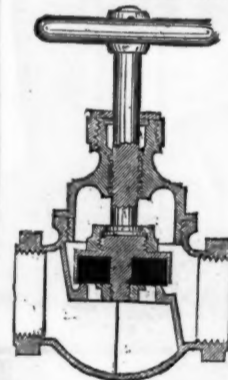
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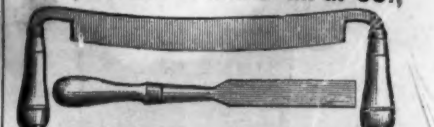
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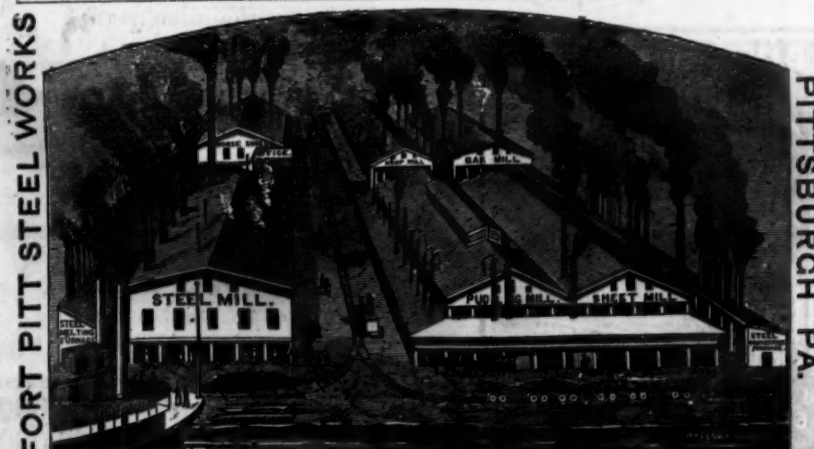
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Pia, Reversible, dis 10 20 c
Spanned, dis 10 20 c
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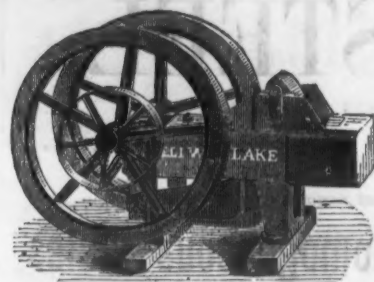
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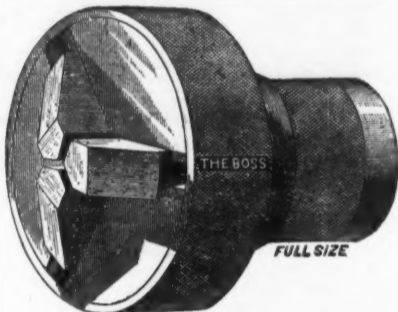
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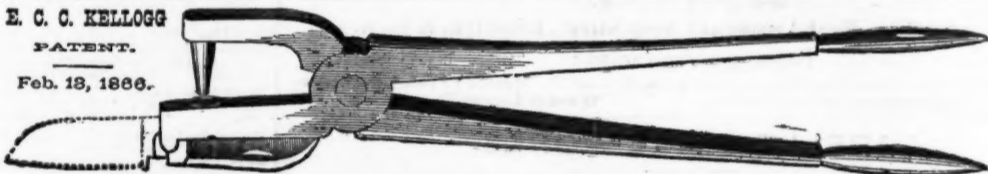
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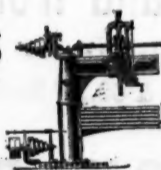
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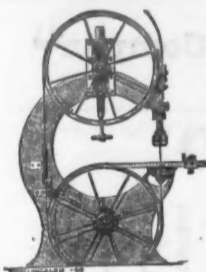
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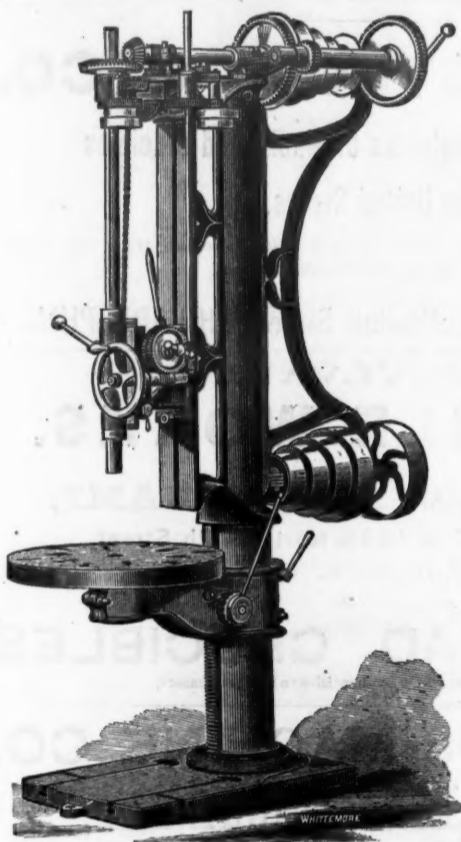
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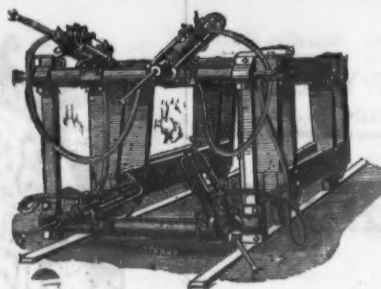
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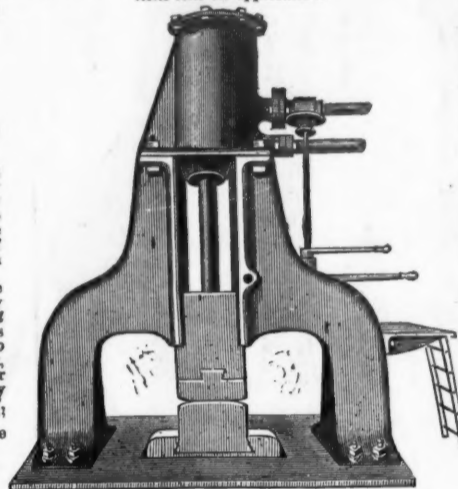
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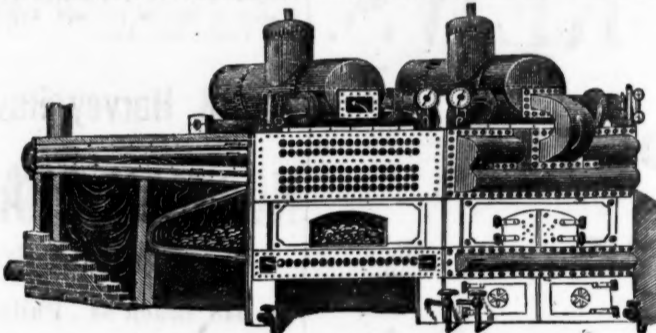
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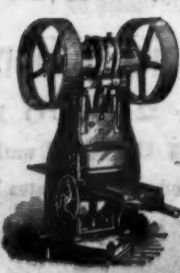
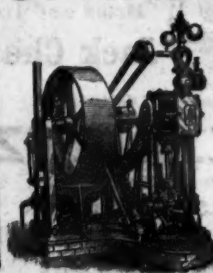
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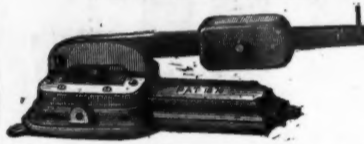
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